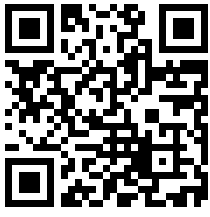

The Book of Knowledge

The Children's Encyclopædia

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CONTENTS OF THIS VOLUME

This is a short guide only to the principal contents of this volume. It is not possible to give the titles of all the Poems and Rhymes, Legends, Problems, colour pages, questions in the Wonder Book, and many other things that come into the volume; but in all cases are given the pages where these parts of our book begin. The full list of these things comes into the big index to the whole work.

WHAT THIS STORY TELLS US

WE think of a reptile as the meanest thing that crawls, and if a man is mean and deceitful and false he is called a reptile. This is too bad to the real reptiles, which come of a very old and respectable family. We ought to speak respectfully of our elders, and, that being so, we should not be impolite to the reptiles, for they are of a far older family than that to which man belongs. We know that reptiles appeared upon the earth next to the fishes and long ages before man, yet we despise him as if the whole reptile family were composed of serpents, which are members of the reptile household. If you told a gentleman who had had turtle soup for dinner that he had been feasting on reptiles he would be disgusted. But it would be true. The turtle which makes the soup is a reptile. There are very many forms of reptiles, big and little, useful and dangerous, and we read here of many members of the family.

REPTILES, THE OLDEST ANIMALS

CONTINUED FROM 1091

WHAT is a reptile? It has cold blood, it creeps, it has a scaly skin, which may be armoured with scales or horn, as in the case of the tortoise and turtle. It breathes as we breathe, all its life, and is not first a fish, which breathes the air in water by means of its gills.

Nearly every boy and girl thinks that a frog is a reptile. It is not. It is an amphibian—an animal that begins life like a fish in the water, and during its life in the water breathes with gills, and afterwards becomes an animal, breathing air.

The reptiles are, in addition to the turtles and tortoises, lizards, snakes, and crocodiles of all sorts. There used to be more forms of reptiles than now exist. Many have become extinct, and among these the largest.

There were all sorts of giant lizards with many and huge teeth. There were creatures with long necks and short tails which could live on the land or in the water, and killed and ate other reptiles. There were giants which lived wholly in the waters, having bodies like whales, whose legs and arms became paddles, and whose structure and habits allied them to the amphibians and the land mammals. There were great lizards which had beaks like the beaks of monstrous birds. There were things like fearful crocodiles, but eighty feet long and thirty feet high, with awful teeth. Then there were the great flying reptiles, some of which had wings twenty-five feet broad and great toothed beaks. It is a blessing that these have gone. Serpents and crocodiles such as we have in the world to-day are bad enough, but they are mild creatures compared with these terrible giants of long ago.

Our reptiles are the poor and comparatively puny descendants of these horrors. To know what the old ones were like we have to dig down into the rocks which once were mud into which the dying monsters sank. But we have still living one reptile which seems hardly to have changed at all, and from that we get a living lesson to tell the story of millions of years ago.

This reptile is the sphenodon, or hatteria, called also the tuatera, a reptile which looks very much like a lizard, but is not a lizard. It is a descendant of the old, old reptiles, almost unchanged. You know that in history many families spring from one family, take different names, go into different countries, follow different trades, and become changed in many ways from the original

family. In course of time the members of the family are lost to sight. They die, or, through many marriages in generation after generation, no more bear the name of their House. But a son of the House may live, and his son's son may have sons, and for generation after generation that family, with its name and characteristics, may live on, by this single line, through all the changes of the world, so that to-day we may find in a village cottage the last direct descendant of a great family of the long ago.

THE SPHENODON, THAT BEARS THE LIKENESS OF THE FIRST REPTILE

And that, very likely, is what has happened with the sphenodon, as it happened, we all remember, in the case of the platypus and the echidna.

Here, after millions of years, we have almost the same type of reptile as that which founded its family. It is a beast of from twenty-four to thirty inches in length, dull olive green, spotted with yellow, but whitish on the under-side. It has the legs and claws of a lizard; it has scales like a lizard. Along the ridge of its back run prickly spines. Most lizards, if caught by the tail or the leg, can snap off the member by which they are held, and grow a new tail or a new leg, as the case may be. The tail of the sphenodon is brittle, and can be snapped off like this, and a new one grown in its place.

The head of the sphenodon is its chief curiosity. It has teeth, not only along the jaws, but down the centre of the roof of its mouth. These do not fit into sockets like our teeth, but grow directly out of the bone of the jaws and palate. When, in course of time, these teeth are worn down, they are not renewed like the teeth of a rat or a rabbit or a beaver. They wear right down to the bone, and the sphenodon is left practically toothless. It eats small animals, but when its teeth have gone it bites with its bony jaws.

THE SPHENODON REMINDS US OF THE TIME WHEN MEN HAD THREE EYES

The most remarkable feature of the sphenodon is, however, the remnant of a third eye, which is found at the top of its head. The sphenodon cannot see with this eye; for seeing it uses the two eyes at the sides of its head. But once upon a time it did use this eye for looking upward without turning up its head.

Traces of this eye have been found in all creatures which have a backbone, but its nature was not understood, and a great man declared that it was the seat of the human soul. But the sphenodon solves the mystery for us. Once we all had three eyes, and this "pineal eye," as it is called, is the remnant of what was an organ of vision. It is more plainly to be seen in the sphenodon than in any other creature; but even here it is now of no use, for it is covered with a horny scale.

The sphenodon once lived in thousands in New Zealand, long before human beings appeared there. But the Maoris killed all they could find, and pigs killed and ate still more. So now the poor creature has its home only in little islands near New Zealand, where human beings do not go, and lives in a burrow all day long, and comes out at night to feed. It ought to be carefully preserved, for it is really a living fossil, a link with the animal life of millions of years ago.

As we have seen an animal called a lizard which is not a lizard, we will now look at the lizard family proper.

THE LIZARD THAT WARNS ITS FRIENDS WHEN THE CROCODILE IS COMING

Lizards live in all lands except where the ice and snow never melt. They are found in England and in the northern United States, and they attain great size in warmer lands. There is one in the Himalayas a foot in length which resembles a flabby-skinned crocodile, and lives on the putrid flesh of dead animals and birds. Others are to be found in deserts, where animal life would seem almost impossible.

The most important lizard is the monitor, the biggest and best developed of the family. It lives in the rivers of India and Africa, and is feared by the natives. In India they say that the baby monitor is more deadly than the serpent, which is quite untrue. It grows to a huge size. There is one in the London College of Surgeons which measures nearly seven feet. The principal food of the monitor is crocodile eggs, or young crocodiles, while its greatest enemy is the big crocodile itself. It

is said that when a monitor sees a crocodile approaching it gives its fellows warning with a hiss, when they all plunge into the water. That is how it gets its name of monitor.

Down in the south-western corner of the United States, in the hot deserts, there are scores of kinds of lizards, some very beautiful in colour, some dull and ugly in appearance, and one, the heloderma, yellow and black, with a poisonous bite. It is the only poisonous lizard known. In Florida and westward along the Gulf coast, one sees everywhere the pretty and harmless little green lizards, which some people call chameleons, but which are not that at all. We have two sorts of small, harmless lizards, which are commonly seen, however, all over the warmer eastern parts of the Union. The most numerous and widespread of these is the fence-lizard, or swift, which can run like a streak when frightened. It is greenish or bluish or bronzed above, with black, wavy crossbars, and in the throat and lower parts is brilliant blue and black ; but it varies greatly in colour.

THE LIZARD THAT CAN SNAP HIS TAIL IN TWO AND GROW ANOTHER

From lizards to snakes the step is not far, so it is not surprising to find lizards which resemble snakes, with long, slender, snake-like bodies and tiny legs. One of them, the glass-snake, has no visible legs at all. It is called a glass-snake because its body is so brittle that, if caught, it can snap off its tail as easily as you could snap thin glass. Nature enables it to do this by constructing its bones in such a way that they may be easily separated. By this means the glass-snake can slip away, and grow more tail, ready to break at another attempt to catch him.

There is a sort of northern glass-snake which can break off its tail, and so escape. This is called the blind-worm. It looks more like a small snake than a worm, for it has excellent eyes ; but it is not a snake, nor a worm. It is one of the legless lizards, and is fairly numerous in this country. It eats slugs and worms, and is a capital friend of the gardener, if he could only believe it. In the autumn it meets its friends, and, to the number of a dozen or more, they hide under fallen leaves or in a hole at the foot of a tree to sleep the winter away. The blind-worm is one of the family of lizards called skinks.

The skink is six or eight inches long, only half the length of our blind-worm, and lives in Africa. There are many varieties. Some have excellent legs, some have very weak legs, some have only pretences at legs, and some, the acontias, like the blind-worm and the glass-snake, have no legs at all.

THE LITTLE LIZARDS THAT CAN WALK UPSIDE DOWN LIKE FLIES

There are about 1,800 sorts of lizards, so we cannot do more than glance at the most remarkable. One of the commonest in Africa, India, and other warm countries, is the gecko, yet it is one of the strangest. Some of them run about the houses like flies. They run up and down the walls, and cross the ceilings, walking back downwards, just like the flies and other insects which they are seeking for food. They can do this because their feet are provided with discs which act as suckers, thus enabling them to cling to smooth walls and other surfaces as the fly clings.

The most wonderful thing they do is to climb a smooth tree and walk head downwards on the under-side of its big leaves. They are really useful to man, but natives are terribly afraid of them, believing that the little lizards deliberately poison human food by walking over it with their feet. In the feet, they think, the gecko carries its poison, and so they call it the toe-spitter. Really it has no poison, neither does it cause illness, although the natives call it " the father of leprosy."

THE HARMLESS LIZARD THAT FRIGHTENED MEN FOR AGES

In another big lizard family we find the iguana, of which there are nearly sixty varieties. The common iguana is to be found all over Mexico and Central America, and the people eat it. It may be anywhere from three feet to six feet in length, and as it lives almost entirely in the trees its colour is naturally green, to resemble the foliage upon which it feeds. With its long tail, its scaly body, its spiny back, and the hanging pouch beneath its throat, it looks very grim, but not so formidable as the African basilisk.

The basilisk has not the throat-pouch, but it has upon its back a crest-like great fin, which it can move up and down. And, as if to make up for the absence of the throat-sac, it has a sac

upon its head which it can inflate and move backwards and forwards. The basilisk is quite harmless, and as it climbs splendidly, and dives and swims as well as the crocodile, it has quite a good time in life. So remarkable is its appearance that from old times ignorant men have regarded it as a monster of evil. In old writings we find it said that the basilisk was hatched by a serpent from a cock's egg; that to encounter its glance meant death, and that it had to live in a desert because its breath was of fire and burnt up everything living about it.

Another remarkable lizard is the crowned tapayaxin, which people in California and the South-west call the horned toad, from its resemblance to a big toad with horns. Its head is armed with long, horny spikes, and the same sort of weapon occurs all along the back and sides right down to the tip of its tail. The colour of this singular lizard is grey, with bands of brown on the back, while underneath it is a brilliant yellow. Its spikes were not formed for the fun of the thing, nor are they for ornament; they are for its protection.

THE LIZARD ARMED WITH SPEARS, WHICH CATCHES FLIES ON THE WING

Terrible as it looks, this creature is harmless. When attacked, it burrows with amazing rapidity into the sand and disappears. It can deceive men into thinking that it has popped down a hole. But its animal enemies know its habits, and they pounce upon it more quickly than we can. Therefore the tough spikes with which it is armed serve as protection while the lizard is digging. An enemy would seize it by the tail, but there are the spikes all the way along, ready to pierce any mouth into which it might be drawn.

When captive, this lizard is very sluggish, but when wild and in search of food it can run like a flash of lightning, as, of course, it must, to catch the flies upon which it lives. Most reptiles are thought to be lazy and sluggish things, but some lizards run very swiftly. One living in Transcaspia runs so swiftly that we can only see its shadow as it scurries along with its tail curled up over its back. As a rule, the lizards which are most fleet of foot are those least heavily armoured. Those which cannot run so fast need greater protection from their enemies. It is because he is one of the most sluggish of the family that the frightful-looking moloch, the spiny lizard of Australia, is so smothered with prickles. It has a horn above each eye and another in the middle of its head. And all over its body, sides, back, legs, toes, one could scarcely stick a pin for spikes and horny warts. Luckily, it is only about ten inches long.

THE FLYING DRAGON THAT HUNTS IN THE AIR WITH A PARACHUTE

Leaving this old slow-coach, we jump now to the opposite extreme, to find a lizard so active that it is called the flying dragon. It is not a very big lizard, being only a few inches in length, but it is very important to us as showing what changes can be made in the structure of creatures belonging to the same family. This little lizard lives among the trees and eats insects. Actively as he runs, he is not fast enough for the insects which can fly out from the tree in which he hunts, so gradually the lizard has grown a parachute along the sides of its body.

It is not like the parachute of the other flying animals of which we have read. Here the ribs of the lizard grow straight from the body, farther than the spread of its arms, and a skin grows over and covers them all. The ribs can be moved so that the little dragon can fold up his parachute when he does not need it. When he wishes to launch himself from one tree to another, or from a height to the ground, he straightens out his wings and flits away so rapidly that the eye cannot follow him from branch to branch. He can cover a distance of thirty feet, and can guide himself in the direction he wishes to take.

THE LIZARD WITH A FRILL THAT OPENS AND TERRIFIES ITS ENEMIES

There is a flying gecko, which has a sort of fringe round its body, like the wing membrane of a bird and like the membrane which the flying monsters of old time had. The fringed lizard must not be confused with the frilled lizard, an extraordinary creature living in Australia. The frilled lizard is about three feet long, and can run on its hind legs like the old monsters did. Instead of a parachute or fringe, it has a wonderful frill right round its neck. This at ordinary times lies in folds about the

lizard's neck, but when the reptile is frightened or angry the frill expands into a great circular fan all round its head. The lizard opens its red-lined mouth as wide as possible, and shows an alarming array of teeth, and altogether its appearance is so unsual and horrible that the boldest hunter might fear to go near it. Its frill is intended to frighten the animal's enemies rather than to serve as a wing.

THE CHAMELEON LIZARD, WITH ITS CHANGING COAT OF MANY COLOURS

We have now picked out all the most famous of the great lizard family, but we have for the last perhaps the most wonderful of all. There is one which is a sort of crawling rainbow. This is the chameleon, the lizard which can make itself almost any colour it wishes. The most sluggish of all the lizards, it crawls along the bough of the trees in which it makes its home as if to-morrow would do for the next step. It must be to make up for this slowness that the chameleon has this power to change colour. Its natural colour seems to be a grey-black, but beneath its skin are two layers of cells, containing, one, brilliant yellow; the other, dark brown. Somehow or other, the chameleon is able to get the most extraordinary results from the combination. Many of the changes may be accidental, like our blushing.

At one time it may be striped like a zebra, or covered with yellow spots. Next it will be chestnut and black, like a leopard. Then, again, it will turn a brilliant green. When it wishes to make a complete change of colour, it draws in a deep breath, which puffs it up far beyond its ordinary size, and next minute the change is made.

HOW THE CHAMELEON CAN LOOK ALL WAYS AT THE SAME TIME

The purpose of this is easy to see. When it is making its way through trees, it does not wish to be seen by snakes which climb trees, so it takes the colour of its surroundings. The spots and stripes would well represent the appearance of part of the tree upon which the sun was shining between the twigs and leaves. When the sun is hidden, its natural colour on the green of the leaves would make it invisible. Contrast would reveal it, but similarity to its surroundings is a perfect disguise. It is curiously formed in many other respects than this. Its feet are shaped for nothing else than tree-climbing. It has very prominent eyeballs, but they are so covered up by the lids that only tiny beads of the eye appear. To make up for this the chameleon can rol its eyes in any direction. Moreover, when one eye is looking up, the other can look down; one can look to the front, while the other surveys the scene at the back. Then, to make up for its slowness, it has a quick-acting tongue. The lizard itself is only a foot in length, including the tail, which helps it to cling; but the tongue is six inches long. When a fly or an insect appears near the chameleon, the latter shoots out its tongue and catches it. The tongue is shaped like a cup at the end, and is covered with a sticky fluid, from which there is no escape.

Should flies fail to appear, the chameleon does not much mind. He can go for months without food. It is this power of his to fast which made men believe that it lived on air. This chameleon lives in the Old World,—not in America; but the green lizard of Florida is often wrongly called so.

THE CROCODILE FAMILY, THE RULERS OF THE REPTILE WORLD

We come now to the kings of the reptile world, the crocodiles. The chief forms are the crocodile proper, which lives in Africa, India, Northern Australia, Cuba, and South America; the alligator, which lives only in China and America; and the gavial, which lives in India, Borneo, and Northern Australia. The differences between the three great members of the family are these: The head of the alligator is short and broad; the head of the crocodile is long; the head of the gavial is longest and narrowest of all, and it has an air-sac over the nostrils which it can inflate.

The crocodile, when young, eats fish, but as it grows older it eats animals and men and women. It seizes its victim with its terrible jaws, draws it under the water and drowns it. In order that he may do this without danger to himself, the crocodile has developed a special type of head and throat. He must breathe the air as we must, hence, if he remains long quite under water, he must drown, like the rest of us. Therefore, his nostrils grow at

the tip of the snout, so that he can keep the greater parts of his jaws under water and yet have his nostrils free to breathe. But as he is now holding a man or an animal in his jaws, his mouth is kept open under the water, and there still seems a chance of his being suffocated. But he has a muscular arrangement of the throat which he can close. Thus he can breathe safely, for the nostrils open into the throat behind the valve which keeps the water from flowing down his throat. He breathes while his mouth is full of water.

WONDERFUL STORIES OF LIVING MEN WHO HAVE BEEN BURIED BY CROCODILES

Now, although the crocodile has such a fearful array of teeth, he does not bite up and masticate his food before swallowing it. He tears off the flesh and bolts it. The result is that, after a full meal, the food takes so long to digest that he is reduced to a condition of torpor, and must sprawl about the mudbanks of the river, or lie in the water with his nose peeping out, until his food has been disgested. In consequence of this, however, he has learned that putrid flesh is more readily torn and devoured than the flesh of a victim newly killed. Therefore, if he is not specially hungry, he will take the body of a man or an animal and actually bury it, so that the flesh may putrefy.

Hunters say that men who know the habit of the crocodile have escaped, after being caught, by lying perfectly still and pretending to be dead while the crocodile buries them and goes off, leaving them to push aside the earth and dart away. This fondness of the crocodile for putrid flesh is of importance to the countries in which he lives. Many bodies of dead animals float down the tropical rivers. If it were not for the crocodiles, these bodies would poison the waters and the air around.

THE BIRD THAT WARNS THE CROCODILE OF DANGER AND ACTS AS ITS TOOTHPICK

It is very likely on this account, indeed, that wise men among the ancient Egyptians taught the people that they should not destroy these creatures in their hot rivers, and so the crocodiles came to be regarded as sacred.

Crocodiles live for hundreds of years if not molested. They seem to go on growing all the time. Some of those in the upper parts of the Nile attain a length of thirty feet. They have bodies covered with armour which, in the water and mud, look like the logs of trees. In places where they are numerous, they lie so close together in the water as to present the appearance of a raft of logs stretching across the river. Should a hunter appear, however, the crocodile receives timely warning. There is a bird in attendance called the ziczac, from the cry which it makes. Just as the rhinoceros bird warns its master of approaching danger, so the ziczac warns the crocodile or alligator. It does not work for nothing. Upon the body of the crocodile are insects which the bird eats. More wonderful, however, is the way in which these birds act as toothpicks for the crocodile. The latter lies for hours with his jaws open. The little birds run in and out of its mouth and peck off the fragments of flesh which have collected about the crocodile's teeth.

OUR AMERICAN ALLIGATORS—WHERE THEY LIVED AND HOW THEY LIVED

The hot, sluggish waters of Florida, Mississippi, and Louisiana were just the place for alligators, and the first settlers found these reptiles swarming. Their hoarse bellowings could be heard on summer nights like the noise of a herd of angry bulls. Sometimes they were very large, too, so that it was dangerous to go where they were. For that reason it was thought necessary to kill them off. Afterwards it was found that the thick, knobbed hide was valuable as leather. So hunters began killing and skinning them by the thousands. Consequently alligators have almost disappeared from rivers easily reached, and remain numerous only in the remotest swamps.

THE NEWT IN FACT, AND THE SALAMANDER OF FANCY

A little creature common in quiet waters of both America and Europe is often mistaken for a lizard, and so called; but it is not a lizard, but a newt, and a cousin of the frog. It has a lizard's shape; with a long pointed head, four small legs and a long tail, but its skin is not scaly, but smooth and leathery, and it lives most of its time in the water, breathing through gills in the side of its head. The newt must have abundant moisture or it will die. It is so constructed that when it is

out of the water it is able to squeeze moisture through the pores of its skin from a store which it carries underneath, and so keep cool and damp. If it were kept altogether from moisture, its body would dry up, and it would die.

The power of distributing moisture over the outside of its skin enables it to live for some time from water. The salamander, a famous relative of the newt, has this power to an even greater extent. It is a sort of newt, black and yellow and brilliant, which lives in parts of Europe and in Africa, and when touched is so cold and moist that men long believed it could live in a fire without being burnt.

When Benvenuto Cellini, the great artist, was a little boy, he was sitting by the fire, when he noticed what he thought was a little lizard among the red-hot coals. His father suddenly gave him a box on the ears, and made him cry. Then his father said, "My dear little boy, I did not hurt you for any harm that you had done, but only that you might remember having seen a salamander in the fire," then kissed him, and gave him some money. Probably they had not seen a salamander. If it were one, then it had by accident got among the coals and been put on the fire. It would soon die.

How a Mother Newt Lays Eggs in a Pond and Guards Them from Fish

People so believed that the salamander could live unharmed in the fire that some of them still call asbestos, which fire does not consume, "salamander's wool." There are no longer any salamanders, but we used to have them—giants, with leg-bones bigger than an elephant's.

The mother newt in an English pond lays her eggs one by one on the leaves of plants growing in or by the water. When an egg has been laid, the newt folds the leaf and seals it with a sticky solution, and leaves it safe. It is believed that she guards the eggs, for one has been seen to chase a fish away which was trying to get the eggs.

In about fourteen days the eggs hatch, and the baby newts appear. They look just like little fishes, having little fish-like bodies, without legs. They have gills growing out from the neck, with which they breathe the air in the water. In the course of a fortnight the front legs appear, and at the end of three weeks the hind ones begin to sprout; while the gills get smaller, lungs begin to grow, with which the newt breathes the air of the atmosphere. So far the newt has lived only on vegetation, but now it begins to eat insects. In six weeks the gills disappear, the legs are formed, and the newt, for the first time, leaves the pond and goes to look for worms and snails and so forth.

The Merry Little Frogs and Toads That Live in the Garden

Having glanced at one family of amphibians we may turn to another, the frogs and toads. They are the commonest things in the garden and by the pond-side, yet few people know much about them. They think the frog is a toad, and that both are highly poisonous. As a matter of fact, the toad has a poison under its skin and in those two bumps behind his head, but that poison is only used if a dog or mole or hedgehog or other enemy takes it up. Then the toad squirts forth this acid and burns the mouth of its enemy; the juice is never used except to enable the toad to get away. The frog has not this poison and is perfectly harmless.

How can you distinguish between the two? Well, the frog has sharp little teeth; the toad has none. The frog has a smooth, damp skin; the toad has a rough skin and shorter hind legs than the frog, and does not leap far. The toad is shy, and comes out only at night from its hole; the frog, though also shy, is bolder than the toad, and hunts by daylight. The female toad lays her eggs all joined together on a sticky string; the frog lays hers all in a mass stuck together, looking like dark soap-bubbles as they float on the water.

The Wise Mother Frog Who Saved Her Eggs from the Gardener

It is surprising how clever the frog is in placing her eggs for safety. In the conservatories near that in which the little girl found the newt there are water-tanks to which the frogs go. But the gardeners frequently dip their cans in and take out water, and so might catch and destroy the eggs of the frogs. So a wise mother-frog went outside the conservatory, jumped on to the lowest point of the roof, and laid her eggs in a little gully, just where it enters the top of a pipe leading into the

conservatory tank. It is by that gully and pipe that the rain from the conservatory roof is carried from the roof down into the conservatory, so the mother frog knew that there would be plenty of moisture for the eggs. Another frog went lower, to the deep stone drain into which this pipe falls, and placed her eggs there. Then, when they were hatched, all the little frogs had to do was to pop through the short piece of pipe running through the conservatory wall into the great tank.

THE EARLY LIFE OF THE LITTLE TADPOLE, BETTER KNOWN AS TOMMY TOE-BITER

But we have said "little frogs." Now, they are not little frogs at all when born. They are tadpoles, which some of us call Tommy Toe-biters. When first hatched the tadpoles look like baby newts, but they undergo strange changes. At the sides of the neck are the gills with which the tadpole breathes the air in the water—for it could not breathe the air of the atmosphere. It has as yet no mouth, but for a while it lives upon the nourishment which was stored in its little body while in the egg. Under its throat are two tiny hands, or suckers. With these, when it is tired with swimming about, it can fasten itself to a water-leaf and rest and sleep. By-and-by a little horny mouth is formed, and with this it is able to eat small water-weeds. The tadpole goes on growing rapidly, inside and out. The big gills begin to get smaller, and lungs to form inside. Soon the little hind legs begin to appear, for all this time the tadpole has been using his tail as a means of swimming. Next the front legs are formed, and when he is two months old the little one is able to breathe in the water, or to pop up to the surface and take a gulp of the air of the wonderful world beyond his pond or tank.

THE LIFE OF THE TADPOLE WHILE THE GREAT CHANGE IS BEING MADE

Then, when he is ten weeks old, the gills disappear, the horny covering of the jaws falls off, the mouth becomes wider, teeth show, the old skin of the whole body is cast off, and there you have a hungry little tadpole living on his tail. While these rapid changes are being made he loses his appetite a little, and the body has to be nourished on the substance contained in the tail.

When the changes have been made, the tadpole is very hungry, for all the goodness is gone out of his tail. He will eat meat, insects, or other little tadpoles; he will even try with his baby mouth to nibble the toes of little boys who are wading in his pond. This lasts only until he gets out of the water. When at last the tail has quite disappeared, and neat little, trim little froggy in his coat so shiny and green leaps to the land, he wants no more little boys' toes; he is looking out now for worms and caterpillars and insects. Nearly everything that does damage to the flowers in the garden, to the fruit and rare growths in the conservatories, to the crops in the fields, the frog eats.

We have no better friends in the garden than the frog and toad. The frog works by day, the toad works by night, and between them they eat an enormous number of insects. The frog catches flies as the chameleon does, with his tongue, but he has good teeth with which to bite up a beetle. They both go to sleep in the winter, the toad in a damp hole or in the mud, the frog in the mud at the bottom of his pond.

THE GREAT AGE OF THE TOAD AND HIS POWER OF ENDURANCE

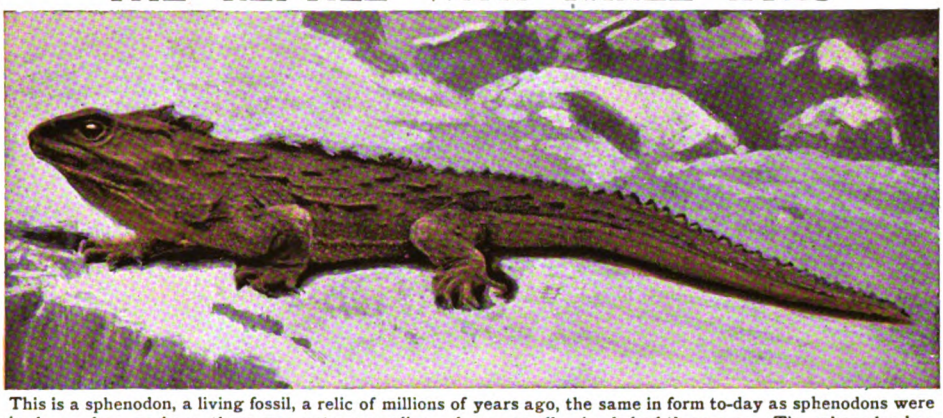
Toads live a very great time. We know for certain that they can live for forty years. Sometimes they are said to be found alive in rocks and coal, but nobody has been able to prove this. Dean Buckland tried experiments with toads to prove this and their powers of endurance, and found that toads enclosed in cells cut in limestone were dead in less than a year. Toads in sandstone, through which air, and possibly tiny insects, could enter, lived for two years, and one of them grew fat.

There are many strange varieties of toads abroad. There is a toad which burrows with shovel-like hands. One in South America grows to a length of eight inches. Some live in trees. One of these, the rhacoporus, has little wing-hands, great webs of skin between his toes, enabling him to "fly."

One of the strangest toads is the Surinam toad. The female carries her eggs upon her back, where a skin grows over them and protects them until they are hatched. Then out hop, not tadpoles, but tiny, merry toads.

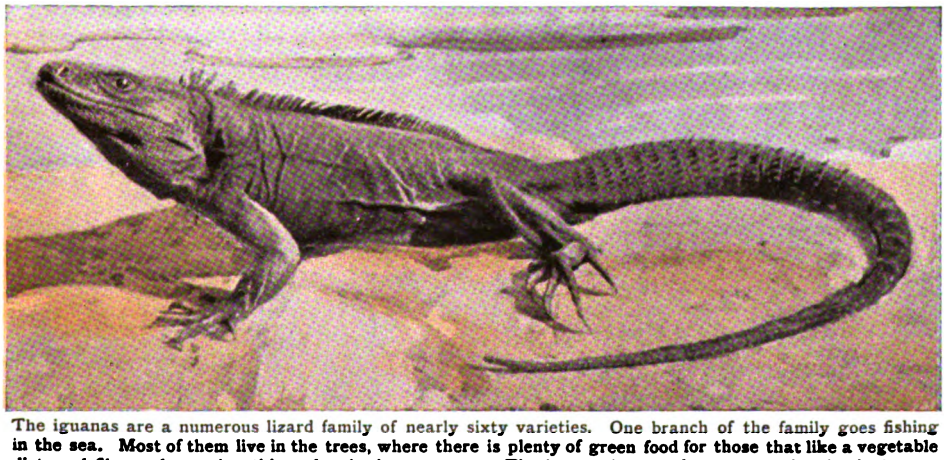
The next stories of animals begin on 1373.

THE REPTILE WITH THREE EYES



This is a sphenodon, a living fossil, a relic of millions of years ago, the same in form to-day as sphenodons were in days when, perhaps, there was not a man alive. Ages ago all animals had three eyes. The sphenodon has **the remnant of a third eye plainly visible, on the top of its head, though the eye is now without sight.**

The monitor is the biggest and best developed of all lizards. When it sees a crocodile coming, it makes a hissing sound to warn its fellows. The monitor eats the crocodile's eggs, but the crocodile eats the monitor when it can catch it. Monitors grow seven feet long, and though they bite if attacked, they are usually harmless.

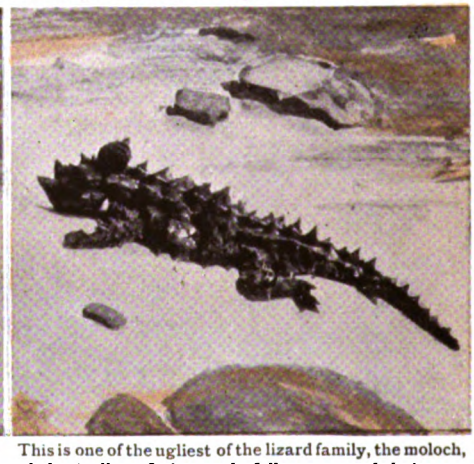


The iguanas are a numerous lizard family of nearly sixty varieties. One branch of the family goes fishing **in the sea. Most of them live in the trees, where there is plenty of green food for those that like a vegetable diet, and flies and creeping things for the insect-eaters. The iguana is an ugly creature, but its looks are worse than its bite. It does not harm human beings, except to frighten those who fear its appearance.**

THE LIZARD THAT BREAKS IN TWO

Every year somebody in the country digs up things supposed to be deadly serpents. Generally they are slow-worms, or blind-worms, like this. It looks like a snake, but it is neither snake nor worm, neither is it blind. It is really a lizard without legs. Slugs and worms and other things harmful to the garden form its chief food.

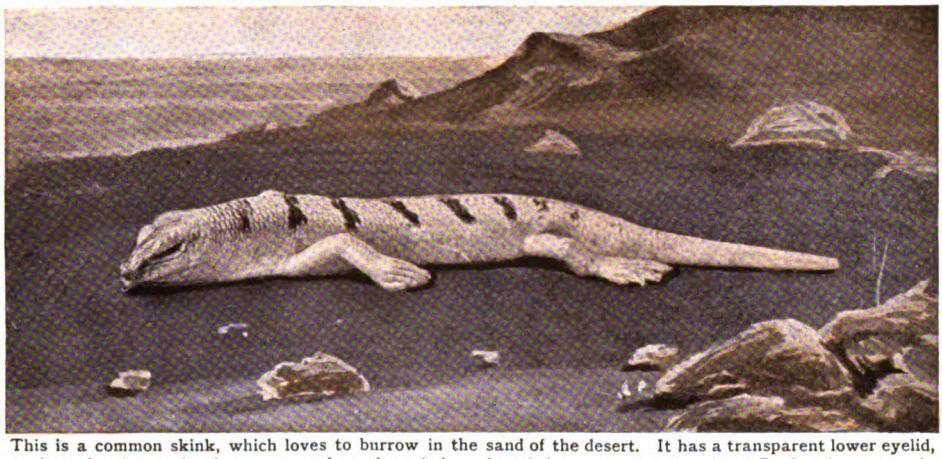
There are but two sorts of lizards in England. This is one of them, the sand-lizard, which lives on flies and other things which do damage to the crops.



This is one of the ugliest of the lizard family, the moloch, of Australia. It is wonderfully armoured, but very slow and quite gentle, and eats only little ants.

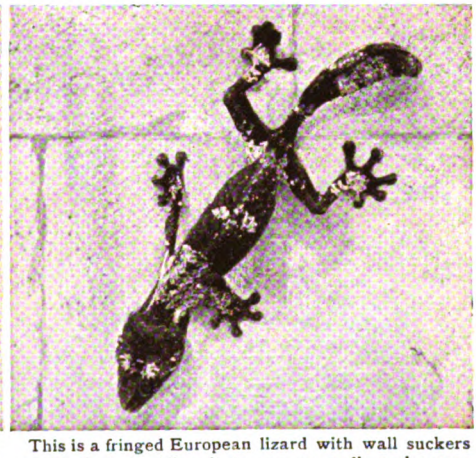
Another reptile wrongly named is the glass-snake. It is a lizard, although we all call it the glass-snake. It is named the glass-snake because it is so brittle. If caught by the tail it can snap itself away, leaving its tail in the hand of its startled captor. When free, the glass-snake grows another tail, and is ready for a second escape. The slow-worm, the sphenodon, and many lizards can do the same thing.

THE LIZARD'S COAT OF MANY COLOURS



This is a common skink, which loves to burrow in the sand of the desert. It has a transparent lower eyelid, so that when burrowing it can see as through a window, though its eyes are quite shut. Snakes have a scaly covering to their eyes to keep out thorns. In the East natives use skink flesh as medicine, as Europeans once did.

The frilled lizard is an ugly creature, and alarms strangers to the desert by its habit of running swiftly, open-mouthed, in an upright position, on its hind legs.



This is a fringed European lizard with wall suckers on its feet, enabling it to run up walls and across ceilings, just like the flies which it catches and eats.

It would be useless to tell the chameleon, in lizard language, to nail his colours to the mast. He is always changing his colour. He has the power to make his skin the colour of the leaves among which he is moving. If taken in the hand he can change colour with surprising speed. In many ways the chameleon is the strangest of all the lizards. He is a slow, sleepy creature until a fly appears. Then he swiftly shoots out his six-inch tongue, and the fly is caught. He cannot walk on the ground. There are no true chameleons in America.

THE MERRY LITTLE FROGS AND TOADS

The horned lizard, often called the horned toad, lives in Arizona. The male has a horn on the nose, and sometimes the female has, though not as a rule.

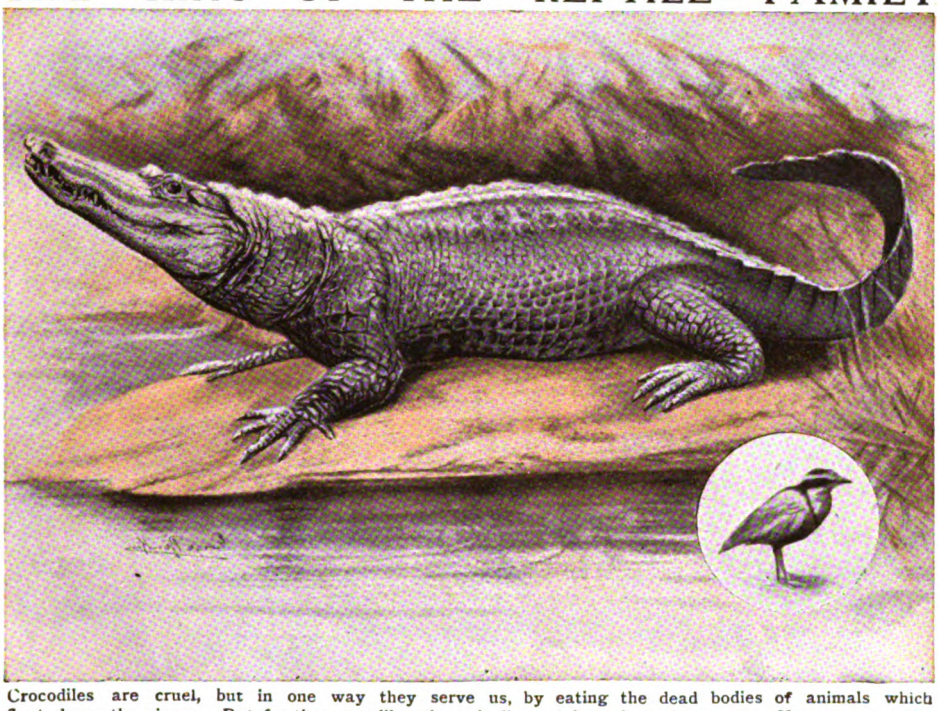
This shows a newt swimming, and several kinds may be found. All are born in the water, but when grown up leave the pond to live on marshy land.

Frogs and newts and salamanders are all born in the water, then they are changed, and leave the water for the land. This is a salamander, which people used to think could live in fire. Salamanders in hot countries go to sleep when water is scarce, just as squirrels and other animals in our country go to sleep when winter comes.

The merry little frog begins life like a fish. It has a tail, and lives on it. Then, after nearly three months, it comes to land and eats things that do damage in the garden

The toad cannot leap so far as the frog, and is more shy. But he is just as useful as a gardener's friend. He lives to a great age, and can fast for months.

THE KING OF THE REPTILE FAMILY



Crocodiles are cruel, but in one way they serve us, by eating the dead bodies of animals which float down the rivers. But for the crocodiles these bodies might poison the water. Here we see the crocodile and the little bird called the ziczac, which picks the food from between the crocodile's teeth.

The alligators have a covering of horny plates, and terrible jaws and teeth. These teeth are frequently renewed, new ones forming in place of those worn out. Alligators are, in this respect, more fortunate than human beings. In America alligators are protected part of the year, because they kill things which damage the crops

The photographs in these pages are by Lewis Medland, W. P. Dando, Charles Reid, and A. S. Rudland.

CRUSOE FINDS A FOOTPRINT IN THE SAND

Fifteen years had Robinson Crusoe lived alone on his desert island without seeing a single sign of any human being. What, then, was his sensation of amazement and dread when, exploring the shore one day, he saw the print of a man's naked foot in the sand! But it was eight years more before he saw any human beings, and they were a party of cannibals who had visited the island to hold a feast. One of their intended victims escaped and was rescued by Crusoe, whose servant he became. This happened on a Friday, so the man was called "Friday."

THE GREATEST STORY OF ADVENTURE

WHEN we read the "Iliad" and the "Odyssey," "The Faërie Queene" and "Don Quixote," we all know that such adventures as those books describe will not fall to us. But in the early part of the eighteenth century an Englishman wrote a story of adventure that for a long time was regarded as a true narrative. He had discovered the art of so telling a story as to induce those who read it to believe it to be true. His name was Daniel Defoe, and his story "Robinson Crusoe." It is a great work of the imagination, although the real adventures of a shipwrecked sailor, named Alexander Selkirk, may have suggested the idea of "Robinson Crusoe" to Defoe. The story has been translated into many foreign languages. It is on account of "Robinson Crusoe" that Daniel Defoe is called the Father of English Fiction.

ROBINSON CRUSOE

How Crusoe Ran Away and Became a Sailor

CONTINUED FROM 1140

AT the beginning of his story Robinson Crusoe tells us that he was born in York, in 1632, the third son of a good family. His father intended him for the law, but he would be satisfied with nothing but going to sea. His father, a wise and grave man, gave him serious and excellent counsel, telling him that it was men of desperate fortunes, on the one hand, or of aspiring, superior fortunes, on the other, who went abroad upon adventures; that his was the middle state, which he had found by long experience was the best state in the world.

"A few days wore it all off. And about a year after, being one day at Hull, leaving my father and mother to hear of it as they might, and without asking God's blessing or my father's, on September 1st, 1651, I went on board a ship bound for London."

This vessel was wrecked, but the men made their way on shore in a boat sent from a lightship. They landed near Cromer, and walked to Yarmouth, where they had money given them to carry them to Hull or London, as they thought fit. Without heeding the warning of the master of the wrecked vessel, who bemoaned the fact that he had taken one so like Jonah in his ship, Robinson Crusoe hardened his heart against going back and went on to London, where he took passage as a gentleman adventurer on board a vessel bound for the coast of Africa, the captain of which, taking a fancy to him, instructed him what to buy for trading purposes, and on the voyage taught him much about navigation.

"This voyage, the only voyage which I may say was successful in all my adventures, made me both a sailor and a merchant; for I brought home five pounds nine ounces of gold-dust, which yielded me in London, at my return, £300 ($1,500), and this filled me with those aspiring thoughts which have since so completed my ruin."

Investing $500 of his new-gained wealth in another adventure, and lodging the other $1,000 with the friendly captain's widow, Robinson Crusoe once more set out on the same ship, which was this time captained by its former mate. One morning when they were making their course towards the Canary Islands, they were surprised by a Moorish rover of Sallee, and, after a severe fight, were carried prisoners into that port.

While the other men were carried up-country to the emperor's court, Robinson Crusoe was kept as a prize by the pirate captain, and made his slave.

"When," he says, "my new master went to sea, he left me on shore to look after his little garden, and to do the common drudgery of slaves about his house; and when he came home again from his cruise he ordered me to lie in the cabin to look after the ship."

ROBINSON CRUSOE GOES EXPLORING

After Crusoe had succeeded in bringing all the provisions from the wrecked ship to the shore, and building himself a safe shelter from the attacks of man and beast, he began exploring the island on which he was cast, in company with the ship's dog. Nowhere did he find any trace of man, but he discovered **many fertile and beautiful places, and a variety of animals and birds which proved good for his larder.**

CRUSOE'S ESCAPE FROM THE PIRATE

Or the Strange Fishing Expedition

AFTER about two years had passed, the pirate stayed on shore for a longer time than usual. He took Crusoe with him in his pinnace when he went a-fishing, and Crusoe soon became so skilful at catching fish that he was sometimes sent alone, with a kinsman of the pirate's and a young Moor as his sole companions.

A HEAVY FOG AT SEA AND HOW THE PIRATE WAS CAUGHT IN IT

On one occasion when the pirate was out in the pinnace a thick fog arose, and they had rowed out to sea a long distance before they were aware of it. After this the pirate had the long-boat of the English ship that he had taken fitted up for future excursions of the kind, and this was the beginning of the events that led up to Crusoe's escape, the whole circumstances of which may well be told in his own words:

"It happened that he (the pirate) had appointed to go out in this boat with two or three Moors of some distinction, and had therefore sent on board overnight a larger store of provisions than usual, and had ordered me to get ready three muskets with powder and shot, for that they designed some fowling as well as fishing. The next morning my patron came on board alone, and told me his guests had put off going, and ordered me, with the man and boy, as usual, to go out with the boat and catch them some fish, for that his friends were to sup at his house.

WHY ROBINSON CRUSOE WOULD NOT CATCH FISH FOR HIS MASTER

"This moment my former notions of deliverance darted into my thoughts, for now I found I was likely to have a little ship at my command, and, my master being gone, I prepared to furnish myself, not for fishing, but for a voyage. Thus furnished with everything needful, we sailed out of the port to fish.

"After we had fished some time and caught nothing—for when I had fish on my hook I would not pull them up—I said to the Moor, 'This will not do; our master will not be thus served; we must stand farther off.' He, thinking no harm, agreed, and, being in the head of the boat, set the sails.

"When we were about a league farther out, giving the boy the helm, I stepped forward to where the Moor was, and, making as if I stooped for something behind him, I took him by surprise with my arm under his waist, and tossed him clear overboard into the sea.

"He rose immediately, for he swam like a cork, and begged to be taken in, telling me he would go all over the world with me. But there was no venturing to trust him, so I stepped into the cabin, and, fetching one of the fowling-pieces, I presented it at him, and told him I had done him no hurt, and would do him none if he would be quiet. 'But,' said I, 'you swim well enough to reach the shore, and the sea is calm. But if you come near the boat I'll shoot you through the head, for I am resolved to have my liberty!' So he turned about and swam for the shore; and I make no doubt but he reached it with ease, for he was an excellent swimmer.

CRUSOE AND HIS BLACK BOY MAKE A VERY LONG VOYAGE

"When he was gone I turned to the boy, whom they called Xury, and said, 'Xury, if you will be faithful to me, I'll make you a great man; but if you will not stroke your face to be true to me'—that is, swear by Mahomet and his father's beard—'I must throw you into the sea, too!' The boy smiled in my face, and spoke so innocently that I could not mistrust him, and swore to be faithful to me, and to go all over the world with me.

"While I was in view of the Moor that was swimming, I stood out directly to sea," the story goes on to say. "But as soon as it grew dusk I steered my course that I might keep in with the shore, and made such sail that I believe by the next day at three in the afternoon, when I first made the land, I could not be less than 150 miles south of Sallee.

"It was not till I had sailed for five days, however, that I ventured to make the coast. We came to anchor in the mouth of a little river. I neither saw nor desired to see any people; the principal thing I wanted was fresh water."

CRUSOE BECOMES A RICH MAN

And Goes Away on a Great Adventure

"We came into this creek in the evening, resolving to swim on shore as soon as it was dark. Then we heard such dreadful noises of wild creatures that the poor boy was ready to die with fear, and begged not to go on shore till day. 'Well, Xury,' said I, 'then I won't; but it may be we may see men by day who will be as bad to us as those lions.' 'Then we give them the shoot-gun,' said Xury.

"But we were obliged to go on shore somewhere or other for water, for we had not a pint left in the boat. Xury said if I would let him go on shore with one of the jars, he would find if there was any water, and bring some to me. I asked him why he would go? He answered me with so much affection that made me love him ever after. Said he, 'If wild mans come, they eat me; you go way.' 'Well, Xury,' said I, 'we will both go, and if the wild mans come we will kill them—they shall eat neither of us.'

"So I gave Xury a piece of rusk-bread to eat, and a dram out of our patron's case of bottles; and we hauled the boat in as near the shore as we thought was proper, and waded on shore, carrying nothing but our arms and two jars for water.

A SEARCH FOR WATER IN A STRANGE LAND, AND XURY'S DEVOTION

"I did not care to go out of sight of the boat, fearing the coming of canoes with savages down the river; but the boy, seeing a low place about a mile up the country, rambled to it, and by-and-by I saw him come running towards me. I thought he was pursued by some savage or wild beast, and I ran forward to help him. But when I came nearer to him I saw something hanging over his shoulders, which was a creature he had shot, like a hare, but different in colour, and longer legs. However, we were very glad of it, and it was very good meat.

"But the great joy that Xury came with was to tell me he had found good water and no wild mans. But we found afterwards that we need not take such pains for water, for a little higher up the creek we found the water fresh when the tide was out; so we filled our jars and feasted on the hare, and prepared to go on our way."

After an encounter with a party of peaceable negroes, Crusoe coasted till he came near Cape de Verd, where he was picked up by a Portuguese ship bound for the Brazils. The captain proved very friendly, and, refusing to take anything from Crusoe, offered instead to buy both the boat and Xury. Crusoe was loth to sell the boy, but on the captain promising to give him his liberty in ten years if he turned Christian, and Xury saying he was willing to go, Crusoe let the captain have him.

CRUSOE MAKES A FORTUNE IN SOUTH AMERICA

After a good voyage they reached the Brazils. Here Crusoe entered into partnership with a sugar planter. He wrote to his friend the widow and asked her to send out one half of the value of the money he had left with her, in English goods, consigned to Lisbon, whence the Portuguese captain brought them to him on his next voyage to the Brazils.

Selling these goods to advantage, Crusoe started a tobacco plantation, and at the end of four years, being wealthy, but still unsatisfied, thought out a scheme whereby he might gain riches at even a quicker rate.

So he spoke to his fellow-planters and the merchants at San Salvador of his early voyage to Africa, and of how easy it was, in exchange for trifles, not only to get ivory, gold-dust, etc., but slaves for service in the plantations. And one day three of the planters came to him with a proposal that they should furnish a ship for such a purpose as he had outlined, and that he should go in it as a supercargo and do the trading.

HE PREPARES FOR AN ADVENTUROUS VOYAGE TO AFRICA

Unable to resist this offer, according to which he should have a share of the proceeds without providing any part of the cost, Crusoe made a will disposing of his plantations and effects in the event of his death.

"In short," he says, "I took all possible caution to preserve my effects and keep up my plantation. Had I

used half as much prudence to have looked into my own interest, and have made a judgment of what I ought to have done, and not to have done, I had certainly not have gone away from so prosperous an undertaking, and gone upon a voyage attended with all its common hazards, to say nothing of the reasons I had to expect particular misfortunes to myself. But I was hurried on, and obeyed blindly the dictates of my fancy rather than my reason."

WRECKED ON THE DESERT ISLAND

Robinson Crusoe Escapes a Watery Grave

WHEN the ship in which Crusoe and his companions sailed from the Brazils had been about twelve days out, it was caught in a violent hurricane, and they were taken quite out of their reckoning. One of the men died of fever, and a man and a boy were washed overboard.

It was resolved to make for the West Indies, the vessel being in a very battered condition, when they were taken by another great tornado, and for twelve days together they could do nothing but drive before the wind.

While they were still at the mercy of wind and wave, one of the men espied land. The others had no sooner run out of the cabin to see where they were when the ship struck upon a sand-bank, and, the waves breaking over her, they committed themselves, being eleven in number, to the boat, to God's mercy, and the wild sea. For though the storm had abated considerably, the sea ran dreadfully high.

After they had been driven about a league and a half, a raging wave, mountain high, took them with such fury that the boat was overturned, and its occupants were all swallowed up in a moment.

HOW CRUSOE WAS SAVED FROM THE SHIPWRECK

"The sea landed me," says Crusoe, "or, rather, dashed me, against a piece of rock, and that with such force that it left me senseless. And had it returned again immediately I must have been strangled in the water. But I recovered a little before the return of the waters, and got to the mainland, where, to my great comfort, I clambered up the clefts of the shore, and sat me down upon the grass, free from danger and quite out of reach of the water.

"I was now landed and safe on shore, and began to look up and thank God that my life was saved in a case wherein there was some minutes before scarce any room to hope. I believe it is impossible to express to the life what the ecstasies and transports of the soul are when it is so saved, as I may say, out of the very grave. I walked about the shore, lifting up my hands, and my whole being wrapt up in the contemplation of my deliverance, making a thousand gestures and motions which I cannot describe, reflecting upon all my comrades who were drowned, and that there should not be one soul saved but myself; for, as for them, I never saw them afterwards, or any sign of them, except three of their hats, one cap, and two shoes that were not fellows. I cast my eyes to the stranded vessel, as it lay so far off, and considered, Lord, how was it possible I could get on shore?"

THE FIRST NIGHT OF THE SHIPWRECKED SAILOR ON THE ISLAND

When, however, Crusoe began to look about him, his comforts began to abate. He was wet. He had no change of clothes. There was nothing to eat or drink. He had no weapon—nothing but a knife, a tobacco-pipe, and a little tobacco in a box. And night was coming on. All the remedy that occurred to him was to get up into a thick, bushy tree, like a fir, but thorny, that grew near, there to pass the night.

But first of all he walked inland a bit, and, to his great joy, found fresh water, which somewhat revived him. Having drunk and put a little tobacco into his mouth to prevent hunger, he went to the tree, got up into it, and endeavoured so to place himself that if he slept he might not fall.

He soon fell asleep. And so fatigued had he become that he did not wake till it was broad day. He then found that the storm had abated, and that the weather was clear.

CRUSOE'S LIFE IN HIS ISLAND HOME

And the Building of His Fortress

WHEN Crusoe awoke from his sleep in the tree, he saw that the wrecked ship had been lifted from the sandbank, and carried much further inland. At the ebbing of the tide he was able to get within a quarter of a mile of her. So, hoping to get some things from her that would be useful, he swam out, and by the help of a piece of hanging rope managed to clamber on board. A dog and two cats were the only living creatures left on board, and these became his companions.

HOW THE PROVISIONS AND CARGO WERE REMOVED FROM THE WRECK

There being no time to lose, he filled his pockets with biscuits, which he ate as he went about, and he made a raft. On this he fastened some seamen's chests. He filled these with provisions, tools, and ammunition, and then got his raft ashore.

The next day he again swam to the ship, and, making another raft, brought more stores ashore. For eleven days he kept returning to the vessel, and so brought away pretty well all that was on board. The next morning, when he left the hut he had made for himself on the shore, he looked out to sea, and, behold! the ship was no longer to be seen.

Then, finding a little plain on a rising hill of rock which commanded a good view of the sea, so that if any ship came in view he might be able to signal to her, he resolved to fix up a tent of sails here.

In front of where his tent was to be he drew a semicircle some twenty yards in diameter, and touching the rock at both ends. Along the edge of this semicircle he planted two rows of strong stakes, one six inches behind the other, driving them into the ground till they stood about 5½ feet above ground.

THE INGENIOUS DEFENCES OF CRUSOE'S ISLAND HOME

He sharpened the tops of the stakes, and filled the gap between them with cable from the ship, and then placed other stakes inside, leaning against the others, about 2½ feet high, like a spur to a post. He thus had a fence so strong that neither man nor beast could get over it. He left no door, but made a short ladder, which, when he was in, he lifted over after him.

Into this fence or fortress he, with infinite labour, carried all his riches, provisions, and stores. Having fixed up a kind of double tent, a smaller one within and one larger above it, he covered the whole with a large tarpaulin which he had saved among the sails.

Finding the rock behind—which was slightly hollowed out like the entrance to a cave—soft, he enlarged the hollow into a cave, and this he called his kitchen. His gunpowder he put into about a hundred bags, and put these into different parts of the rock, so that if any exploded it would not mean the loss of all his store.

In order that he might not lose his reckoning of time, he cut the following words on a large post: "I came on shore here on September 30th, 1659," and, making a kind of cross, set this up on the shore. On the sides of the post he every day cut a notch, making every seventh notch as long again as the rest to mark the Sundays.

HOW CRUSOE WAITED FOUR YEARS TO GET SOME BREAD

Meanwhile, he discovered that there were goats, rabbits, and wild cats on the island, as well as wild birds. Of every creature he shot he preserved the skin.

When his fortress was completed, he made some chairs and a table, having, for every board he wanted, to cut down a tree, hew it thin with an axe, and smooth it with an adze. Later, after a storm, parts of the old wreck were washed ashore, and he was thus provided with planks and bolts.

One day, just before the rainy season, he emptied what appeared to be a quantity of husks and dust from an old barley-bag on to the ground. After the rains he saw a few stalks of something green shooting up. Later, a number of ears of barley and rice came out. He saved these ears, and sowed them again and again; but it was not until he had been four years on the island that he ventured to use any of the grains to make bread.

He tells us of the precautions he had to take against the rabbits and birds who threatened his growing grain; how he was terrified by an earthquake,

which, however, caused no harm; how he fell sick, and, recovering, found comfort in the Bible he had brought from the ship; and how, going to the other side of the island, he found a fruitful valley, where he built himself a country seat or "bower."

In another part of the island he found abundance of turtles, wild hares, and fowls. He caught a parrot, and taught it to repeat his name. He caught a number of goats, and, breeding them in enclosures, was safeguarded against the failure of ammunition, and supplied with milk as well as meat, for the boiling of which he made some rough earthenware pots.

CRUSOE MAKES A CANOE AND GOES FOR A LONG SAIL

After he had been on the island for six years he made a canoe, in which he attempted to sail round the island, and was all but drowned. He made himself clothes out of the skins he saved, and became proficient in making baskets.

He gives us this sketch of himself in his new garb: "I had a great, high, shapeless cap made of goat's skin, a rough jacket of the same coming down to about the middle of the thighs, and a pair of open-kneed breeches made of the skin of an old he-goat, and a pair of buskins. I had on a broad belt of goat's skin dried; and in a frog on either side of this I hung a little saw and a hatchet. At the end of another belt, which hung over my shoulder, hung two pouches, made of goat's skin, too. In one hung my powder, and in another my shot. At my back I carried my basket, on my shoulder my gun, and over my head a great, clumsy, ugly goat-skin umbrella. My beard I had cut pretty short, but on my upper lip I wore a large pair of Mahometan moustachios."

When not tending his plantations or his animals, Crusoe went out on short trips in his canoe or took walks about the island. Altogether, he found his time fully occupied.

THE MYSTERIOUS FOOTPRINT IN THE SAND

And the Coming of Man Friday

ONE day, when he had been on the island for fifteen years, Crusoe was exceedingly surprised to see the print of a man's naked foot on the shore. He stood like one who had seen an apparition; then he fled back to his fortress like one pursued. That night he did not sleep. He did not stir out for three days and three nights for fear.

From the opposite side of the island Crusoe had seen a dim streak on the horizon. He took this for the mainland. He now concluded that the footprint had been left by some savages from the mainland, and proceeded to take great precautions for his safety.

When, some time later, he discovered a number of skulls and human bones, the remains of a cannibal feast, he hurried back to his dwelling with a feeling of thankfulness that he had been cast on a side of the island where the savages did not come. One morning, after he had been on the island for about twenty-three years, he was amazed to see a party of savages on his side of the island, and, going down to the shore after their departure, he found the remains of another cannibal feast. This caused him to redouble his precautions against discovery.

Some months later another wreck was cast up, and from this he obtained a quantity of new stores. Two years afterwards he was again alarmed by the arrival of another party of savages. They brought two prisoners. While they were cutting one up, the other ran away in Crusoe's direction. Three of the cannibals gave chase. Crusoe rescued the fugitive, who became his devoted servant. This incident taking place on a Friday, Crusoe called the black man Friday. He taught him many words of English, and the man became very useful and a welcome companion.

CRUSOE FINDS TWO MORE COMPANIONS, INCLUDING FRIDAY'S FATHER

One day Friday came running to his master in great alarm. A party of savages had arrived, and Friday was sure they had come for him. Comforting him as well as he was able, Crusoe armed himself and Friday, and sallied out from his castle.

When they came in sight of the savages, the latter were seen eating a prisoner, while another captive was lying bound upon the sand. This

captive was a white man. Crusoe and Friday fired upon the party, killing some and scaring the others. While Crusoe was attending to the white man, Friday found a third prisoner lying in the bottom of one of the canoes, and this captive proved to be his father. Crusoe now had three companions.

As soon as he was able to give an account of himself, the white man, a Spaniard, proved to be one of a band of seventeen who had been shipwrecked and cast among the savages of the nation to which Friday belonged. They were treated well; but shortly a terwards their friends went to war with a rival tribe, were beaten, and several of them, including the Spaniard and Friday's father, were taken prisoners.

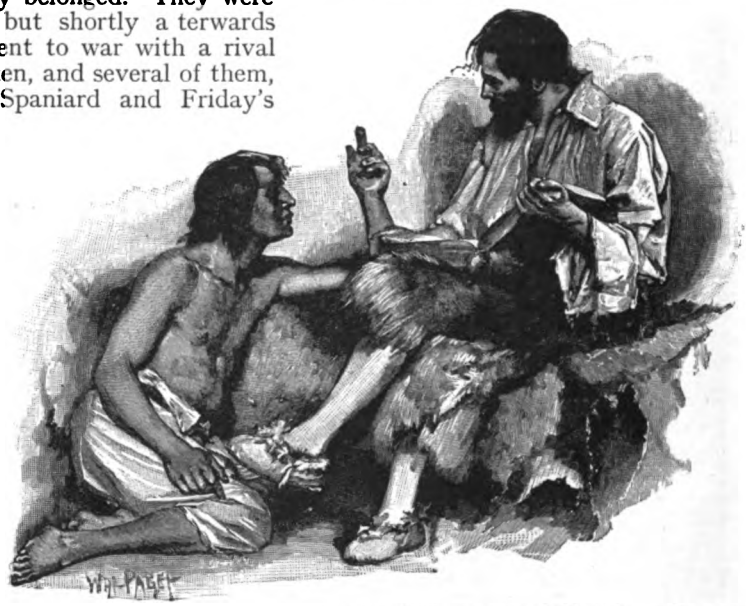
Crusoe and Friday had made a canoe before this occurrence, and it was decided that in this the Spaniard and Friday's father should bring the other Spaniards to the island.

After their departure an English ship came in sight. From this vessel a number of men landed near Crusoe's habitation. They brought three prisoners. At dusk, while the men were asleep, Crusoe approached the captives, and found that they were the officers of the ship. There had been a mutiny on board.

Crusoe released the three men, and after some exciting episodes the captain was restored to his ship, in which, after leaving the survivors of the mutineers on the island, Crusoe, taking Friday with him, left the island on December 19th, 1686, the same day of the month in which he made his escape from Sallee.

In this vessel Crusoe arrived in England on June 11th, 1687, after an absence of thirty-five years. Soon after he went to Lisbon, and he found out from letters that so well had his estate in the Brazils been managed that he was master of more than $25,000, and an estate worth about $5,000 a year.

Returning to England, Crusoe married, and settled down on a farm in Bedfordshire. But the old roving spirit came upon him again, and, his wife dying, he started out once more, revisiting his island, now a fairly thriving colony. He had many other adventures in China and Russian Tartary. Eventually, he reached London again on January 10th, 1705, after another absence of over ten years.



Robinson Crusoe, after being twenty-three years alone, was very glad indeed to make a companion of the savage whom he had saved from the cannibals and had christened "Friday." Crusoe spent much of his time in teaching him English words with the aid of his Bible.

"And here," he says, "I resolved to prepare for a longer journey than all these, having lived a life of infinite variety seventy-two years, and learned sufficiently to know the value of retirement and the blessing of ending our days in peace."

Defoe really wrote three books about Robinson Crusoe, not only telling his life, but giving his thoughts on many things. The story we have just read is told in the first and most interesting of these books.

The next story of famous books begins on page 1309.

THE MAPLE LEAF

CANADA'S NATIONAL EMBLEM

CANADA, THE WONDERLAND

CONTINUED FROM 1100

Most Englishmen have friends in Canada, for every year thousands of Britons leave their homes in the Motherland to make homes in the great Dominion.

Let us follow them in imagination, for we want to know why so many patriotic home-loving men and women choose this "overflow" country when work is scarce in the old one, and we want to understand what meets their eyes when they get there. There are three things we can think over before we start.

Canada is thirty times larger than the British Isles; but the number of people who live in the whole of Canada is about the same as that of those who live in London and its suburbs. Yet, though the distances are so great, there are in Canada only one-tenth as many miles of railway as in England.

Thirty times larger than the British Isles! Look at it on the map, stretching from the Atlantic to the Pacific, from the borders of the United States to the shores of the frozen sea round the North Pole. There is room to put down the British Isles in Hudson's Bay on the east coast, and many of the provinces that go to make up present-day Canada are much larger than the whole of the Mother Country. Our journey will show us how it is that the number of people and the length of the railways are so out of proportion to the size of the large country and the small one. The West is calling us, as it called the explorers long ago!

A steamer is awaiting us alongside the great docks at Liverpool. Think of the largest steamer you have seen, and then try to imagine this one, longer than St. Paul's Cathedral and as high as a house. As we wander from deck to deck it seems like many large houses or hotels all put together. There are sleeping-rooms, bath-rooms, dining and drawing rooms, music and play rooms, besides all the great spaces for the engines, the coal, and the cargo and luggage. Maybe you have never been out of sight of land, and strange, indeed, it seems at first to see nothing but water all round one, day after day, for nearly a week.

Perhaps, as you set out, you will think of the old explorers and sailormen pointing their cockle-shells of boats towards the unknown sea of the setting sun. The ocean was lonely, indeed, then. There was little comfort on the slow sailing ships; scant welcome on the other side when reached at last, after a long, dangerous passage.

To-day a cable joins the Old World and the New, and by it we can send a message in a flash of time to engage rooms or any other necessaries on

arrival; the floor of the ocean has been sounded and laid down in charts for our guidance; we constantly meet and pass other steamers on the great highway, and we can speak to them by wireless telegraphy. Throb, throb, go the mighty engines day and night, as the steamer forges ahead, making for the same "great front door" into Canada through which the brave pioneers pushed their way long ago.

THE ST. LAWRENCE RIVER, THE GREAT FRONT DOOR OF CANADA

This great front door is the splendid St. Lawrence River, carrying more water into the sea than any other river in the world except one. In winter this front door is fast closed by ice, and then the steamer lands its passengers at Halifax, in Nova Scotia, or at some other port on the eastern shores where trains are waiting to carry them to where they wish to go.

But our journey is in summer, so after nearly 2,000 miles of open ocean we can still steam on for nearly 1,000 miles up the great river to Montreal. We are passing through what was once the heart of Greater France, the old province of Quebec. The Gibraltar of the New World, the town of Quebec, towers above us on our way; we must return to hear its wonderful story, for still the West is calling, and our train waits at Montreal, the Liverpool of Canada.

A truly wonderful line of railway it is that has opened up the New Canada, and linked the Atlantic with the Pacific. And this great railway line links, let us remember, not only the two oceans, for behind the Atlantic is the Old World, and beyond the Pacific is the Far East.

TRAVELLING INTO THE GREAT LONE LAND BEYOND THE LAKES

If the exiles have never been beyond England, they think it a long journey from north to south, or from east to west, of Great Britain, yet twenty-four hours will take them as far as they can go by train in any direction in their homeland. But if they leave Montreal on Sunday morning, they eat, sleep, live in the train till Thursday night, and in that time travel nearly 3,000 miles across the continent to the shores of the Pacific. Till the main railways and their branches opened up the Great Lone Land beyond the lakes, and made it possible for people to travel in it and find out its great uses, this vast stretch of land was looked upon as good only for the hunter to roam over. Little was known about it except from the stories of adventurous travellers.

For twenty-four hours after leaving Montreal we pass through Ontario, the richest and most thickly peopled province in Canada. One of its most striking features is the group of the great lakes, all drained by the St. Lawrence. Lake Superior is large enough to hold Ireland; it is the largest body of fresh water in the world. Its waters connect with those of Michigan and Huron, and these, again, with Erie and Ontario. No wonder the St. Lawrence River carries such a volume of water. Canals have been made where waterfalls and rapids prevent the passage of boats, so that there is continuous waterway for lake steamers for 1,000 miles above Montreal, from Port Arthur on the farthest lake.

CANADA SHARES THE GLORY OF ONE OF THE GREAT WONDERS OF THE WORLD

A busy scene it is, with ships passing to and fro, for there are great ports on the United States side of the lakes, as well as on the Canadian side. The two countries also share one of the greatest wonders in the world between the Lakes Erie and Ontario. There is a drop of some 300 feet between these two lakes, half of which is taken at one mighty plunge by the river which connects them. An island parts the immense volume of water into two falls. It is hard for an English boy to realise the grandeur of Niagara Falls, for in his country there are few waterfalls, and none very high, or carrying much water.

The pictures on page 680 help one a little to understand Niagara. Imagine two great masses of water about three-quarters of a mile broad, madly leaping down a height as great as that of the cliffs at Dover, or a tall church spire, the spray and foam rebounding in clouds as if the water were trying to find its way back to the top. But no picture can give the thundering roar, nor the colours of the whole scene.

The tongue of land called the Lake Peninsula, lying between Lake Erie and Lake Ontario on the one side, and Lake Huron on the other, is part of

CANADA IN SUMMER AND IN WINTER

This is a summer scene by a lake in the Canadian Rockies. Canada has colder winters than ours, and the air is crisp and pure, even in summer. Grapes, peaches, melons, and tomatoes ripen as with us in the open air.

Winter is really winter in Canada. This is a winter scene in Montreal. In Canada the thermometer goes down 20 degrees or more below freezing point, but people then expect that degree of cold and prepare for it. The air is so dry and bracing that the cold weather is not nearly so trying as in a country of damp and mist. Snow-shoes and sleighs and toboggans make Canadian winter days merry for young people.

the rich province of Ontario. Here many English have settled, making fine farms where the forest has been gradually cleared away. Great quantities of fruit, butter, and cheese find their way to the markets of the world from this fertile country. Many manufacturing towns, too, are to be found, and Toronto is a great centre of trade.

THE GREAT FORESTS THAT MAKE CANADA PROSPEROUS AND BEAUTIFUL

The glory of the autumn woods of Ontario are far-famed, with their sunset colours on miles and miles of fine trees. Thousands of men are at work in these forests, cutting down trees and starting the logs and planks on their far journey into other parts of the world. They work in the winter, living in camps, and the noise of the axes, the hauling of the sledges piled up with logs over the frozen snow, turn the lonely forest into a lively, inspiriting scene. When the rivers melt in the spring, the waters carry the logs down the stream, and the force of water in falls and rapids is turned to account for working the saw and pulp mills.

A great deal of the "lumber," as timber is called in Canada, collects at Ottawa, the capital of the Dominion, where the Governor-General lives; and on a fine hill are the Parliament Buildings, where "the daughter settles the affairs of her own house," with the help of the members, who come to talk over and discuss matters of government as the British Parliament does at Westminster. Each province has a small Parliament of its own to attend to its own affairs, and all are represented in the one great Parliament at Ottawa, which manages those matters in which the whole country is interested. The Governor-General is sent out from England to represent the King.

SHINING RAILS THAT CARRY US INTO THE LARGEST WHEATFIELD IN THE WORLD

But the train has been ever speeding west while we have been talking of the wonders of Ontario; and now for many hours it rushes along the northern shores of Lake Superior, often in sight of its wide waters and the piers and wharves of its ports.

From Ontario we pass into Manitoba, once a lonely prairie land, but now growing rapidly into the largest wheatfield in the world. Think of all the large wheatfields you have seen, put together and added to, until they are hundreds of times bigger than the biggest, and you will gain some idea of these boundless level fields of grain, stretching like the sea out to the far-distant horizon, under the whole great arch of the sky. As the train throbs on and on, hour after hour, it seems like a great living conqueror, so completely has the presence of the shining rails changed the face of the country. The deer and buffaloes are gone, and the hunting Indians who lived on them have almost gone, too. Here and there are the Reserve Lands where they put up their tents and live with their fast little ponies.

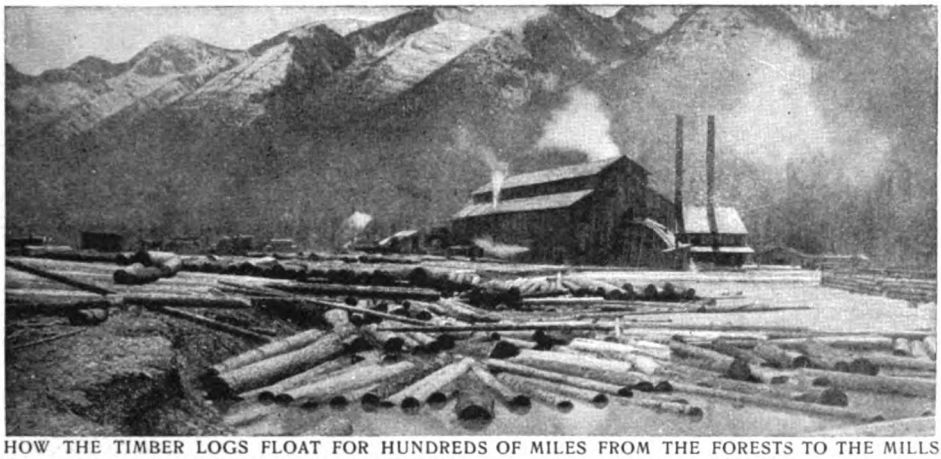
They are urged to learn to work and to farm, and their children are taught in schools and are helped with food and clothing. Now that the buffaloes are gone which they used to hunt, and which provided them with nearly everything they needed, they must learn to live as white men do, or suffer great want and wretchedness.

THE CHANGE THAT HAS COME OVER THE INDIANS SINCE THE WHITE MEN CAME

One feels very sorry for the Indians, who have changed greatly since the white men first set foot on the banks of the St. Lawrence River, about 500 years ago. Now the "Pale Faces" have come in their thousands, brought by the great iron horse. Setting up their homesteads, they plough, sow, reap, and carry the precious food for the millions in hungry Europe, and when time serves they build bridges and make railway lines as these things are needed. Winnipeg, the capital of this wonderful country, was but a small outpost fort a few years ago; now it is a large, handsome city. At the stations in this part of the line are the tall elevators, rising like lighthouses out of a billowy sea, in which the corn is cleaned and stored till it is taken away by train. We shall find in Manitoba and Saskatchewan many men and women who have left Great Britain to make new homes in the West.

But the train, like an unwearied giant, thunders along, till at last the great level wheat lands are left behind, and the country changes, rising in slopes covered with fine, juicy grass, spangled with many-coloured flowers. Two huge provinces are passed, chiefly

THE GREAT NATURAL WEALTH OF CANADA



HOW THE TIMBER LOGS FLOAT FOR HUNDREDS OF MILES FROM THE FORESTS TO THE MILLS

A SHEEP RANCH ON THE GREAT PRAIRIES OF WESTERN CANADA

LOADING SALMON IN BRITISH COLUMBIA, FROM WHERE MILLIONS OF CANS OF SALMON GO

Canada is rich in minerals, in forests of timber, in land for herds of cattle and flocks of sheep and crops of all sorts; and her rivers teem with fish. These three scenes show something of Canada's wealth. At the top is a mass of timber roughly cut up into the logs from the forests, floating for hundreds of miles along the **rivers to the saw-mills. Next we have a view of a sheep farm which a few years ago was a wild prairie. The third shows us a picture of the salmon-fishing industry. The waters of British Columbia are the home of so many fish that she can spare nearly 1,500,000 cases of salmon, containing many millions of cans every year.**

given up to ranching, where cowboys—the wonderful riders—look after great herds of cattle and horses. Towns are springing up, and fresh lines of rails like giant fingers stretch over the land to serve the newly-made farms.

Then the country grows wilder, and at last the Rocky Mountains are in sight. Now, indeed, the train seems like a courageous live creature, plunging fearlessly into dark valleys, over roaring torrents, round the edges of steep precipices, through inky-black tunnels.

Through the Wild Rocky Mountains to British Columbia

At its highest point the line reaches the height of nearly five thousand feet, and above us tower the white peaks and glaciers of the highest Rockies, over 12,000 feet above sea level. Three ranges have to be crossed. People often stay to enjoy the splendid scenery, for there are fine hotels, and a grand national park, 26 miles long and 10 miles wide.

But our journey is nearing its end, and the train rushes through the valley of the Fraser River, and at last pulls up at the Pacific end of the line at Vancouver, the capital of the most western province of British Columbia. This mountainous province has an area of more than 380,000 square miles. Since the railway joined it to the East, many more people have gone to live in it; and it grows more and trades more every year. Its natural riches are of every kind: coal and other minerals, and fish, especially salmon, in the rivers and on the fiord-like coasts. In the forests are the far-famed Douglas firs, often 300 feet high. All kinds of fruit ripen in the fine farms here, especially pears; and great quantities of fruit are exported annually from this part of Canada.

The Cold and Dreary Land of Gold and the Island of Newfoundland

A branch of the great railway line runs up to Dawson City, on the Klondike, near our United States Territory of Alaska. This is the farthest north that the railway goes in Canada; it was needed in this case, because gold was found in this cold, dreary region.

Let us now look at the map of America north of the United States. The whole of this immense stretch of the mainland, together with the islands in the three oceans that border it, make up British North America, slightly larger than the United States, rather less than Europe.

The island of Newfoundland, nearly as large as England without Wales, stands like a sentinel at the great front door to Canada, and though England laid claim to it by right of discovery in early Tudor days, the French managed to slip past it and get first rights on the banks of the mighty St. Lawrence River. This island, Great Britain's first colony, is not yet part of Canada. It is larger than Ireland, and depends on the fisheries of its coasts, chiefly on the banks, where the water is shallow, as in the North Sea. Now, however, great paper-mills are being set up in Newfoundland, and the newspapers that the boys and girls of to-day will read when they grow up may be made from trees grown in Newfoundland.

The Natural Wealth that is being Developed in all Parts of Canada

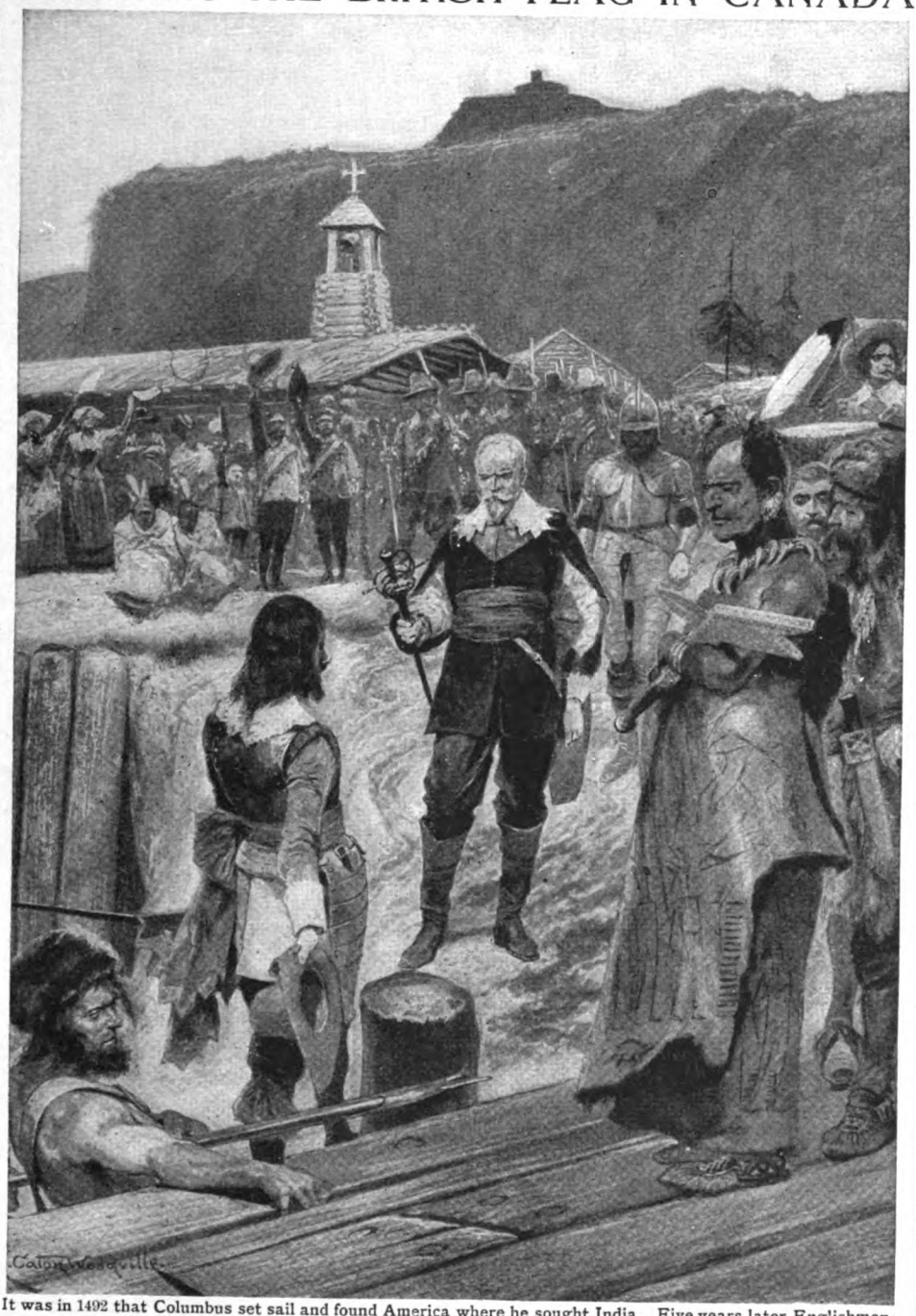
The Dominion of Canada is made up of many large provinces. Near the great front door lie those of New Brunswick, Nova Scotia, Prince Edward's Island, all valuable for their fisheries, and because their ports are never blocked with ice like those on the St. Lawrence. Nova Scotia is one of the great coalfields of the Dominion, and also one of the chief fruit districts. Quebec and Ontario, with their splendid farms and woods, magnificent scenery and waterways, fine towns and buildings, form a grand, strong "heart" for the vigorous Canadian nation, growing greater every year.

Manitoba, with its two large lakes, and Saskatchewan form the great wheat-growing provinces. In Alberta are the cattle ranches; all these are on the east side of the mineral-bearing range of the Rockies.

Beautiful and rich British Columbia has been brought into touch with the East by the railways now sending off lines in all directions.

To the north and east of these lie the great fur countries in their silent vastness. Huge lakes, rivers, and forests give immense quantities of fish, fur, and timber, right away to the land of the reindeer and the little brown folk who catch seals and never wash, and who have one long night in the winter

PLANTING THE BRITISH FLAG IN CANADA



It was in 1492 that Columbus set sail and found America where he sought India. Five years later Englishmen, under Cabot, discovered Newfoundland, and French fishermen went there to catch cod. From there they reached Canada, and in 1534 Jacques Cartier arrived at what is now Newfoundland. He made two other journeys to Canada, claiming it for France. Then Frenchmen tried to settle there. But it was not until Samuel de Champlain was sent out by Henry IV. of France, in 1608, that the French colonists succeeded. Champlain explored and founded settlements, and did his best for the natives. But he was not supported by his sovereign, and in 1629 an English force took him prisoner and sent him to England. Here we see him surrendering to the English. He was afterwards released, and died in Canada in 1635, after it was restored to the French.

and one long day in the summer in their Arctic Circle. It makes one shiver to read of the barren lands and the cold forests, but one can have grand adventures there.

It was the fish, fur, and timber that were first valued in Canada; later were discovered the suitability of its soil and climate for raising stock, for farming, for fruit and wheat growing. The riches hidden under the soil next attracted attention, and now, as the population grows, manufactures of all kinds are starting to use Nature's gifts, and supply the needs of the people.

If we try to see before us a picture of the wealth of Canada, there is the blazing yellow of the corn, the glow of rosy apples and ripe fruit, the golden butter and cheese, the silvery salmon. These, with the grand woods of the forest trees, in shiny glossiness or in powdery pulp for paper, all stand out in splendid profusion from the land of the maple leaf and the beaver.

THE STORY OF CANADA IN THE PAST

It was in the reign of Henry VIII., when the country was in a turmoil as to who should be the head of the Church, and distracted monks were being turned out of their monasteries, that Cartier, a French explorer, having braved the Atlantic, sailed on and on, day after day, up the St. Lawrence, nearly 1,000 miles in all, through forests glowing like gold in their autumn colours.

What courage and determination to face the lonely solitudes, till at last the red man and the white man met! No doubt both were equally alarmed and surprised at the other's appearance.

THE RED MAN AND THE WHITE MAN MEET IN THE LONELY SOLITUDES

"They must be Indians," said Cartier, as Columbus had said before him of the natives he met much further south. Both discoverers jumped to the conclusion that they had found the desired short way to the rich countries of the East, across the western ocean, little dreaming that the whole great continent of America and the Pacific Ocean lay between. Cartier describes how the "Indians" thronged round him and his sailors, wild with delight, like pleased children, and brought presents for their pale-faced visitors.

Before long, other French explorers followed. Montreal and Quebec were founded, and traders and missionaries pushed up the splendid waterways far into the interior, to get the valuable furs the Indian hunters had to sell, and to teach and civilise these wild men of the woods and forests.

For unknown centuries various tribes of the copper-coloured natives, with their fine features and long, straight, black hair, had roamed at will over the wide continent, spending their time in hunting and fishing, and in fighting tribe against tribe. They have no history, no remains to tell of the far past, nothing but stories handed down from lip to lip, and a few circles of stones half buried in the earth.

It was not long before disputes arose between these old inhabitants and the French newcomers, and for long years there was ever renewed fighting, in which the red men had to give way more and yet more to the white men.

Emigrants came out by degrees from France to settle in the new colonies on the banks of the river, and on the peninsula at its mouth which they called Acadia.

As time went on, the English felt they wanted to do more in these regions than fish on the Newfoundland banks, and brave sailors tried again and again to find the North-West Passage to the Indies, which they felt sure lay among the icebergs and snows of the Arctic Ocean.

THE BRAVE MEN WHO GAVE THEIR LIVES TO BUILD UP CANADA LONG AGO

The names of many of them lie scattered over the map of the North of Canada; too often they never reached England again, but died of hunger and cold in the white North.

A very pathetic picture comes to us from the days of James I., when Henry Hudson made three voyages in search of the desired passage, and discovered the great bay which bears his name. His men mutinied, and set him adrift amongst the icebergs without food or sails. He and his companions were never heard of more.

Some fifty years later, when Charles II. was king, he gave to his nephew Rupert large grants of land round the shores of Hudson's Bay and power to form a company to trade in furs. Many rich men put their money together and built ships to carry goods out from England, and furs back from the Great Lone Land. They also built forts in every direction, as more and more land was granted to them, to protect their clerks and traders and trappers.

They were exciting and stirring days then. Soon there was rivalry between the French Canadians and the English fur traders, and the Indians took sides; but it was all for gain, not for love of country.

How these visions of the past rise up before us as we study the map of to-day! There are the difficult-looking Indian place-names scattered all over the country, reminding us of those clever hunters and trappers, of their swiftness of foot, endurance in following a trail, indifference to human life or suffering when on the war-path. We seem to see them hiding behind trees, shooting down the rivers in their canoes of bark, camping before the forts of the white men, who did much to ruin their lives by giving them "fire-water" to drink.

THE THRILLING TALES OF OLDEN DAYS AND BATTLES LONG AGO

The names of the forts—those of the French and also those of the Hudson Bay Company's—still remain to speak of the loneliness of these distant stations, where a few people lived to look after things and collect furs to send on to Europe. Many are the thrilling stories of those days; of a girl of fourteen who held a fort for a week against Indians; of seventeen young Frenchmen—their names are in an old parish register at Montreal—who, with five friendly natives, held at bay for five days 12,000 Iroquois Indians about to descend on Montreal and Quebec. They all lost their lives, but they saved the colony for France. The numerous French names all over the map recall those days when France had not only settled many villages, towns, and forts in Canada, but claimed the whole continent from Mexico to the Arctic, except the strip of Atlantic coast, some 200 miles in width, which then belonged to England.

The French bent all their energies to prevent these colonies of the coast extending west. They built forts to keep them back, and begged for enough soldiers from home to drive the English back and cure them of all wish to return.

HOW CANADA PASSED FROM THE FRENCH TO THE BRITISH IN A NIGHT AND A DAY

No wonder they were feeling anxious about their power. The Hudson Bay Company had been extending their territory in the North, and after Marlborough's wars Acadia had been given up to England and renamed Nova Scotia, or New Scotland. Many disbanded English soldiers then settled there, and Halifax was founded, which has a splendid harbour free from ice. How the French settlers were expelled from the beautiful country they loved so much, and how their troubles and wanderings ended, is all told in Longfellow's poem "Evangeline," which is given in another part of this book.

And now we come to the year when the struggle between France and England for the mastery in North America was decided. The preparations had been long and tedious, and the young General Wolfe was bitterly out of heart. We read on page 1094 how he had been sent to Quebec, and at last decided to make a night attack, and led his men up the steep rock which defended the town. The result of that noiseless climb, and the battle on the Plains of Abraham next day, was that Canada passed from the French to the English, for the forts and villages were too widely scattered to be able to join together and resist.

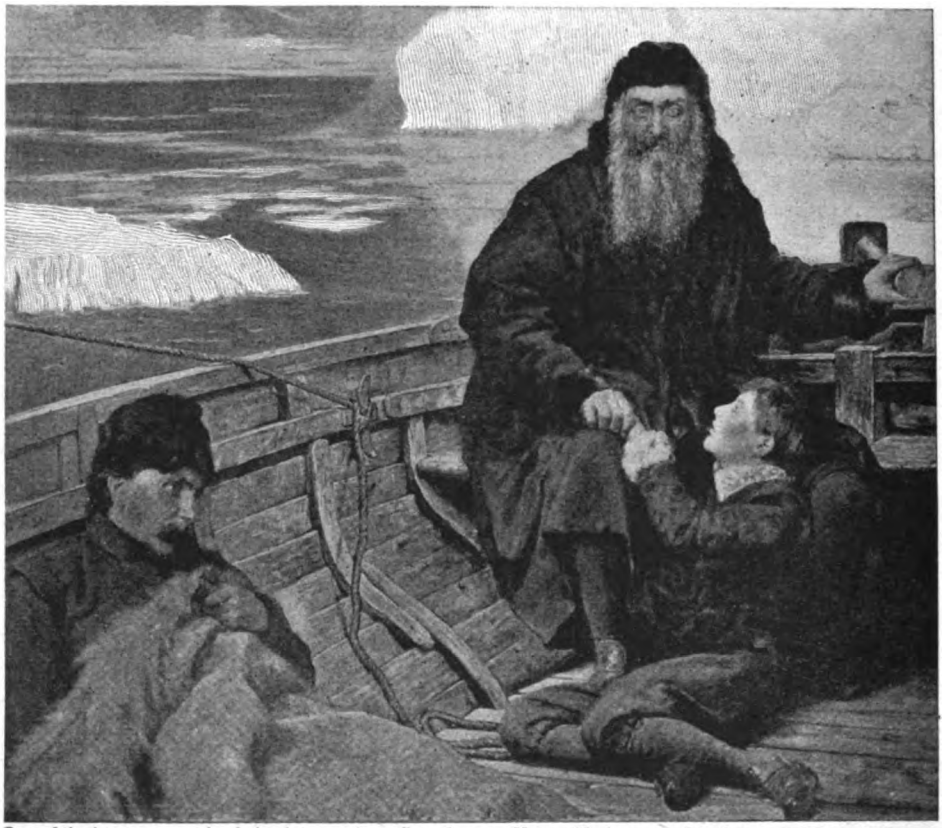
HOW FRENCH AND BRITISH LIVE HAPPILY SIDE BY SIDE IN THE GREAT DOMINION

The French Canadians, living contentedly under their ancient religion, laws, and customs, have proved themselves to be among the most loyal sons of the Empire. They did not join the American colonists when they threw off their obedience to the Mother Country and formed themselves into the United States, some twenty years after Wolfe took Quebec. Many of the Americans who wished to remain under the old flag passed into Canada, where they were known as Loyalists. For about a hundred years these old French provinces were all the Canada there was, and they slowly filled up

with Scotsmen, as we can see from the names on the map, as well as Irish and English. The Hudson Bay Company threw out its forts as far as Vancouver, and British Columbia began to attract settlers. They had a long and difficult journey to get there.

Then came the opening out of the broad rich wheat fields that lie between the Great Lakes and the ranches of the Rockies, and the laying of the long steel lines that bind the West to the East. About forty years ago Quebec, Ontario, New Brunswick, and Nova Scotia united to form the "Dominion." Then the North-west territories were purchased from the Hudson Bay Company. Two years after that the province of Manitoba was added, then Columbia and Prince Edward's Island; afterwards the district on the Klondike where gold was found, and then Saskatchewan, Alberta, and other provinces near them. There is yet room to make more provinces as railways are built and fresh workers come out to settle and improve the land.

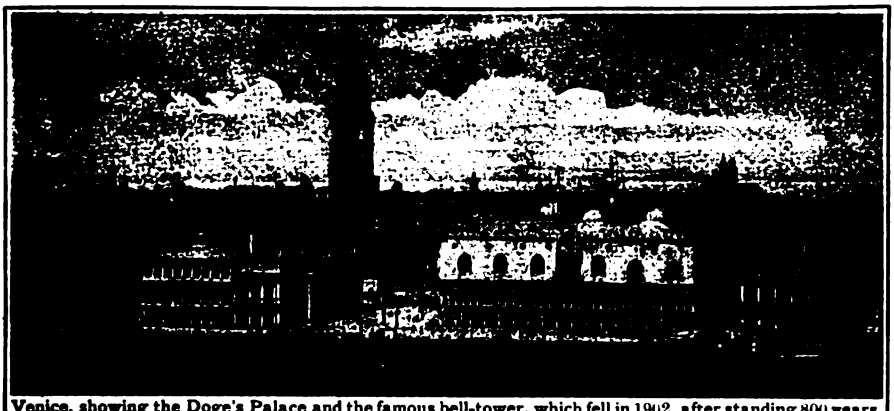
It is not yet 150 years since Montcalm and Wolfe laid down their lives at Quebec, and the French speech and appearance of more than a million people in the old Canada, as well as the build of their towns and villages, make the old days seem very real and near to us.



One of the brave men who helped to explore Canada was Henry Hudson, an English captain of the Dutch East India Company. He discovered the Hudson River, in America, and the great Hudson Bay and Hudson Strait, in Canada. In this picture, by the Hon. John Collier, we see him with the story of suffering in his face, telling of his travels to his little son. They were cruelly deserted, and left in the frozen wilds to starve and die.

Perhaps, as we think over the immense changes brought about since those old days, we shall find it hardest of all to realise that most of them are so very recent, for it is not yet 50 years since railways began to draw together places at vast distances from each other, and open up trade and travel. It is this that has made it possible to unite the large and far-off provinces into one great Canadian nation and Dominion.

The next story of countries begins on 1355.



Venice, showing the Doge's Palace and the famous bell-tower, which fell in 1902, after standing 800 years.

THE MAKERS OF VENICE

CONTINUED FROM 1166

VENICE, the Queen of the Adriatic, is old, but age does not disfigure her. Our admiration and love for her increases as she grows older. She is very beautiful in her old age, and very pathetic. All her glories belong to the past. Venice is slowly decaying.

She stands like some beautiful vision upon the sands of the seashore, and men, as they see her image reflected in the gleaming waters of the lagoon, wonder if it be not some fairy fancy that they picture. Cities such as Venice seem to belong more to dreams and poetic visions than to this world of ours. Before asking who made Venice, we must for a moment recall the means by which this strange city came into existence.

Many hundreds of years ago, when barbarians overthrew the might of Rome, a small number of Roman descendants were driven before the conquering Goths and Lombards down to the coast of the Adriatic Sea. They hid in swamps and in the little islands formed near the coast. Many years passed, and the handful of people who had fled in terror from the Goths became noted as bold fishermen and sailors.

Each island was controlled by its own tribune, appointed by the people of the island, and each island was quite independent of the others. After two centuries, however, the people appointed one man a duke, or doge, to rule over them all, and they became rich and powerful. No longer did they fear attack from the mainland. They constructed bridges to join the islands together, and canals were made along the channels where the water had previously flowed unchecked. They built a powerful fleet, and this fleet they sent, in 827, to Alexandria, where it is said to have recovered and carried back to Venice the body of St. Mark. In honour of this saint the great Cathedral of St. Mark was built.

Venice became a crowded, wealthy, and important city. She sent out her soldiers and her ships with the Crusaders. She built up a great trade. She bought from the East and sold to the West. She bought from the West and sold to the East, and her own manufactures became famous. She made conquests on the mainland, and she captured islands at sea.

Venice became one of the richest cities in the world. Her decline set in when America was discovered, and when the new route to India was found, as we read on page 59. After varying fortunes in war she eventually lost her independence, and is now a part of the kingdom of Italy. While her citizens were so prosperous they had ample means for making their

city beautiful. Her richest residents could not build great military castles, such as the barons of England and of Germany built. There would not have been room for them in Venice. So they built gorgeous palaces of marble. The Republic, as a body, could not build huge forts, for there was neither need for them nor space on which to erect them. So they devoted their money to erect the most splendid halls, council chambers, palaces for their rulers, museums, libraries, and churches.

VENICE, THE BEAUTIFUL CITY THAT RISES FROM THE SEA

They had very little space on which to build, for the city is made up of very many little islands, with the famous Grand Canal running like a capital S between them, and with over a hundred smaller canals, all bridged at frequent intervals. Therefore, as they could not have a city vast in size, they made one unequalled in beauty.

Her widespread trade brought her into relationship with all the civilised world, and she gleaned knowledge from them all. The fall of the Greek Empire sent the learned Greeks to Venice for refuge. They taught the Venetians all that they knew, gave them the treasures of the old writers, and so implanted a love of learning in them that it is to the Venetians that we owe some of our finest literature.

Great works which would have perished for ever were translated by them, and preserved for all the world. The Arabs, who were then among the masters of learning in the world, taught the Venetians how to make gunpowder and how to make glass, and taught them also the first principles of decorative art.

East and west, wherever they went, the Venetians were always learning. In Persia they learned the art of weaving costly fabrics, and gained there a knowledge of architecture.

THE MARBLE BUILDINGS THAT ARE THE GLORY OF VENICE

Their early building combined many styles, which included the elaborate fancy of the East with the sterner simplicity of the northern countries of Europe. But all was so beautifully blended together with a distinct Venetian style, that there was nothing to be found in the world quite like it.

In their conquests they destroyed old buildings so that they might have the marble for their own city. They built the inner walls of their palaces and public buildings with brick, but they covered these with slabs of marble. They had not got good mortar, because it would not withstand the action of sea-water; they needed also marble.

One of their victories opened the way to rich quarries of red marble near Verona, and with this they were delighted. At about the same time the victory in Padua gave them possession of a hard lime which made mortar to defy the sea-water. These two little things show us how desperately anxious they were to improve their beloved city.

The building of St. Mark's Cathedral afforded work for doge after doge, and generation after generation, for hundreds of years. The square in which the wonderful cathedral stands was formerly a field with a canal running through it, and two churches were built within its boundaries. But these churches were pulled down, and the canal was stopped up to make way for the church built to receive the body of St. Mark.

ST. MARK'S CATHEDRAL, WHICH GREW BEAUTIFUL THROUGH THE CENTURIES

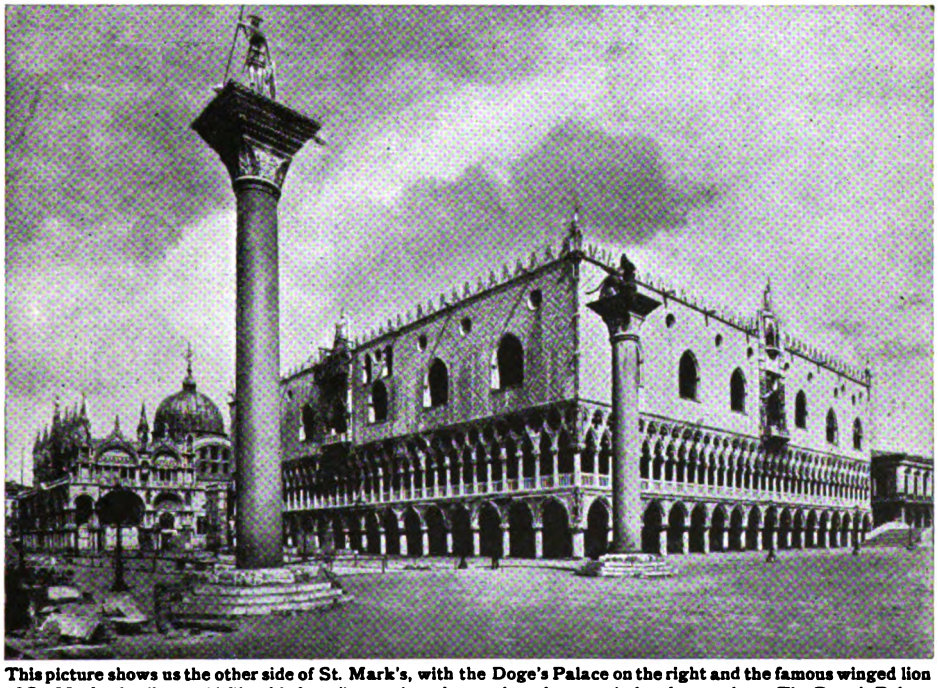
Wherever success attended the armies of Venice, or wherever religious men could buy, other places of worship were deprived of their treasure to enrich the walls of St. Mark's Cathedral. A good example of this we find in the story of the wonderful horses which decorate one end of the exterior of the cathedral. Their story is told on a later page.

For century after century the church grew; its shape was altered, its treasures increased, until, in the beginning of the nineteenth century, the great Napoleon conquered Venice, and put an end to the whole work. It possesses one of the richest collections of church plate, and its retable, or altar-piece, called the Pala d'Oro—a marvellous piece of work in gold, jewels, and enamels, which stands behind the altar—is without equal throughout the world.

It is a picture of Christ, attended by archangels and angels and prophets; but the entire work is in precious metal or valuable jewels, and the most beautiful enamel, through which the rich gold setting shines. It was brought from Constantinople in the year 976. The Doge's Palace is another of the

THE SIGHT THAT NO TRAVELLER FORGETS

The Cathedral of St. Mark at Venice, which is facing us in this picture, is one of the glories of Europe. It has been called the church that can neither be described nor forgotten, and a writer has said that its exquisite architecture makes one glad to be living in this world. As we gaze upon its splendid sculpture, the imagination is bewildered. The great bell-tower collapsed in 1902, but the rebuilding was begun three years later.



This picture shows us the other side of St. Mark's, with the Doge's Palace on the right and the famous winged lion of St. Mark "lording and lifting his front" upon the column where he rests in lonely grandeur. The Doge's Palace is said to be the finest building in the world, and Charles Dickens has described it as "a palace more majestic and magnificent in its old age than all the buildings of the earth in the high prime and fulness of their youth."

wonders of the city, and it is not the less wonderful when we remember that it takes the place of an older building which was pulled down piece by piece to make room for the rising of the new one. It was begun in 1300 by a great doge named Pietro Gradenigo, but before it was finished 150 years had passed away.

THE DUKE WHO PAID A FINE THAT HE MIGHT MAKE VENICE BEAUTIFUL

After nearly a century had passed, the new building had been well advanced, but part of the old palace still stood. The Venetian Council decreed that things should remain as they were, and that anyone daring to propose any more building of the new palace should be fined 1,000 gold ducats. In spite of this, Doge Tomaso Mocenigo did dare to make the proposal. He paid his fine; the rest agreed, and they put the money into the building fund. The enlarging and beautifying of the palace began again in 1424, and did not stop until the work was finished.

It was in connection with this palace that the world-famous Bridge of Sighs was built, but it came more than a century later than the palace. It had been customary to have the State prisons on the ground floor of the Doge's Palace, but in 1588 the Venetians began to build new prisons on the opposite side of the canal, and the bridge was made to let the prisoners pass unseen along one passage in it from the prison to the palace, and back by another passage in it to the prison, where their miserable lives would end. The man who built that bridge built also the famous Rialto Bridge, and he was known as Antonio of the Bridge. The Rialto Bridge took him very nearly three years to build, and was finished in 1591.

THE FAMOUS BELL-TOWER THAT FELL AFTER STANDING NEARLY 800 YEARS

It is not easy to point to many notable architectural features of Venice and say that they are the work of such and such a man. Their building took too long, and engaged too many men in successive generations for that. Thus it was with the famous Campanile of St. Mark's, the magnificent bell-tower standing apart from the cathedral. This was ordered by Doge Pietro Tribuno, about the year 900, but not until 1131 was it finished. It was a noble piece of work, famous in all civilised lands. It stood 325 feet in height by 42 feet square. About 600 years passed away before the well-known great summit, or lantern, with its pyramid roof, was added. They built well in those days, for the Campanile stood until 1902, then, through gradual decay, it fell to the ground. The Venetians have since rebuilt it upon the old foundations.

One name stands out among these old-time architects which we must not overlook—the name of Fra Giovanni Giocondo, who was born at Verona, Italy, in about the middle of the fifteenth century, and died at Rome in 1514. He was a scholar and student all his days, as well as a gifted architect, and many famous men were numbered among his pupils. He travelled a great deal, and worked where he stayed.

Thus he built a fine bridge and a palace in Paris; he made a design for the building of St. Peter's at Rome, and he gave Venice some of her noblest palaces. It is sad to think that one of the most perfect products of his art, one of the smaller Venetian palaces, came in our day to be used as a wretched warehouse.

A GLORIOUS PALACE THAT WAS PLANNED IN THE MIDST OF WARS

Another of the men of this era was Michele Sanmichele, who was trained in the school of Bramante, a great artist, whom we meet among the makers of Rome. Sanmichele, like so many other men of artistic genius, was also a soldier, and the work of fortifying cities engaged in the wars of the period occupied more of his time than art. He managed to build some palaces for Venice, however, the time being about 1550. One of them still retains its glory. It was called the Palace of Grimeni, but is now used as one of the courts of justice, and remains a noble monument to the man who planned it amid wars and rumours of wars.

A greater architect than Sanmichele then arose in the person of Jacopo Sansovino, who was born at Florence in 1477, and lived in Venice from 1527 up to his death in 1576. Several churches stand to his credit in Venice, but the work which immortalised him was the building of the famous library of San Marco, and the Mint, which adjoins it. He built them at the same time, joining wall against wall, to form the most striking contrast. The library, now called the Royal Palace, is one of the

THE SAD & BEAUTIFUL BRIDGE OF SIGHS

A world of sentiment has circled around the beautiful Bridge of Sighs at Venice connecting the State prisons with the Doge's Palace. But while its graceful proportions may call forth our admiration, we need not waste too much sentiment on the bridge, for probably no prisoner who is worth remembering, or whose sorrows deserved sympathy, ever crossed it. There is a copy of the bridge in Northumberland Street, London, near Charing Cross.

sights of the city—a building of great size in two storeys, each supported by a series of arches of the greatest beauty.

Next followed a man to whom English architecture owes much. This was Andrea Palladio, who was born at Vicenza in 1518, and died there when sixty-two. He gave practically all his life to beautifying Venice. He built splendid churches and other edifices, but not palaces. He loved space for his work, and to rear buildings distinguished by dignity and simplicity. He went back to the best Roman style, and was the founder of modern architecture in Italy. He wrote on architecture, and his most important work came into the hands of Inigo Jones, one of the greatest of English architects, whom it greatly influenced.

We must leave the story of the architecture, and turn for a moment to the sculpture. This art in Venice remained chiefly a part of architecture. The architect was sculptor, too. The reasons were twofold. In the first place, the city clung to the examples of the East, which did not provide statues apart from buildings. In the second place, there was a strong desire to keep such open spaces as there were in Venice free from statues.

ANDREA PISANO, WHO TAUGHT VENICE THE IMPORTANCE OF BEAUTIFUL SCULPTURE

So little was the art of the sculptor encouraged that several of the doges in the Middle Ages were buried in tombs carved in the East hundreds of years before. However, Andrea Pisano, one of the great workers of Florence, set an example in the fourteenth century which Venetian sculptors were to follow. The seed thus sown grew slowly, but surely, and from Pisano's day the sculptural work of Venice became more important.

Instead of bringing sculptural decorations from other lands, as they had been in the habit of doing, the Venetians encouraged their own citizens, or, at any rate, men resident in their midst. The first sculptors of note were the Masegne family, who lived in the fourteenth century and the earlier half of the fifteenth century. Next came Pietro Niccolo, of Florence, and Giovanni di Martino, of Fiesole, who worked together and produced, among other works, a fine tomb for the doge who had insisted on continuing the building of the Doge's Palace. They had a fine wooden statue of John the Baptist, from Donatello; and Antonio Rizzo, who acted as one of the architects of the Doge's Palace, and also carried out important military engineering work, proved himself a gifted sculptor, only he ruined himself by dishonesty, and had to flee the city.

A GIFTED FAMILY OF SCULPTORS AND PAINTERS

Much excellent sculptural work was done by the Lombardo family—the Lombardi, as they are called. Not much is known of their history, though Lombardi works are numerous in Venice. The best known of the family was Pietro Lombardo, who died in the first half of the sixteenth century. He had three skilful sons, named Tullio, Antonio, and Giulio; and there were two other Lombardi known to Venice: Sante Lombardo and Moro Lombardo.

All the Lombardi were sculptors or painters. In the workshops of the Lombardi many other sculptors received their training, among them being Alessandro Leopardi, whose name is familiar to every visitor to Venice. Born in the latter half of the fifteenth century, he died about 1545, but his fame remains fresh. Two things make him always notable—the majestic flagstaffs which rise in front of St. Mark's, and the work which he did in connection with the statue of Bartolommeo Colleoni, a famous soldier of Venice who lived in the fifteenth century.

Colleoni's deeds of war are of no account to-day; he is of no more importance to the world than if he had never lived, but he is of interest as having called forth a supreme work of art. He gained great wealth from the wars, and at his death he left all his money and horses and arms to the State, on the condition that they should raise a statue to his memory.

HOW A FORGER WAS CALLED BACK TO VENICE TO CAST A FAMOUS STATUE

The Venetians faithfully carried out their part of the bargain. Although Venetian sculpture was making progress, they could not trust one of their own citizens to do this work. They sent to Florence for Andrea del Verrocchio, who was famous as painter, sculptor, and goldsmith, and memorable to us as a teacher of Leonardo da Vinci. He

THE GRAND CANAL, THE GLORY OF VENICE

The Grand Canal is one of the glories of Venice. A writer has spoken of its "serpent cunning" in reviving memories of the romantic past, and certainly, as we glide silently along the historic waterway in a frail gondola and see the palaces and other buildings on either side in which have taken place scenes of tragedy and glory in Venetian history, we realise something of the splendour and the romance of the days that have gone.

While in the picture above we see the most famous part of the Grand Canal, that which is spanned by the Rialto Bridge, once the centre of trade and commerce, in this picture we have another fine view looking across the canal to the Dogana, or custom-house, built in the 17th century. No picture can convey the beauty of the scene.

The photographs on these pages are by Messrs. Alinari, Brogi, and Anderson.

was born in 1435, and was forty-four when sent for to make the Colleoni statue, which we see on page 4165. He—Verrocchio—had only nine years to live, and we might fancy that he realised that this was to be the last and greatest work of his life.

He devoted to the task all his strength and skill and art, but death overtook him before he could make the bronze casting of the statue of horse and rider. He finished the model and died. Venice had upon her hands the finest model of a horse and rider that had ever been made in the history of the world, but who was to cast it and set it up for all time? There was only one man—Alessandro Leopardi. But he had fallen into evil ways, and some years before had been driven from the city as a forger and criminal. In their need they recalled him, and told him to make the casting.

He atoned for his sin by the way in which he executed the task. He produced a splendid work from Verrocchio's model. The pedestal he modelled and made himself, and it worthily combines in every way with the horse and rider.

One of the noblest monuments ever set up on the earth

The statue is still without comparison. Horse and man seem alive. Mr. Ruskin thought it one of the noblest monuments ever set up on the face of the earth. Colleoni rides with defiant features, proud in his strength as a man, fierce and disdainful in his skill as a general. The horse moves heavily, but with great strength, as upon some dreadful battlefield. Leopardi was not satisfied with the fame which the pedestal gave him, but wrote his name upon the girth of the horse, as though the whole design were his. But nothing can rob Verrocchio of the honour of modelling one of the greatest masterpieces in the world.

But, after all, the great splendour and wonder of Venice belong to her paintings. There never was another place where such a glorious kingdom of pictorial art grew up. Venice is as supreme in this respect as she is for the beauty of her situation and buildings. Her supremacy was not soon won. For a long time she had painters of no special merit—men who painted, not in oils, but in distemper. These pictures were not like life, nor did they express any high ideal. It was just the bad old Italian art that they represented, dull, wooden-looking pictures done in churches and on the walls of other buildings. Then the Bellini family arose, and with them came new light. The glory of Venetian art dawned with them. They began to paint finely in distemper before ever the art of oil-painting had been heard of in Venice.

How the glory of art in Venice dawned with the Bellini family

The improvement began with Jacopo Bellini, who was born probably about 1400, and died about 1464. Jacopo was a pupil of a famous artist named Gentile da Fabriano, a native of Fabriano, who died at Rome about the year 1428. Jacopo followed his master to Florence, where he met all the great men of the time.

He had two sons. The first, born in 1426, he named Gentile, after his old master. The younger son, born in 1428, he named Giovanni. Jacopo never became a great artist himself. His work was an improvement upon anything ever done before in Venice, but his chief credit is that he was the father of two notable sons, who carried out his own splendid ideas.

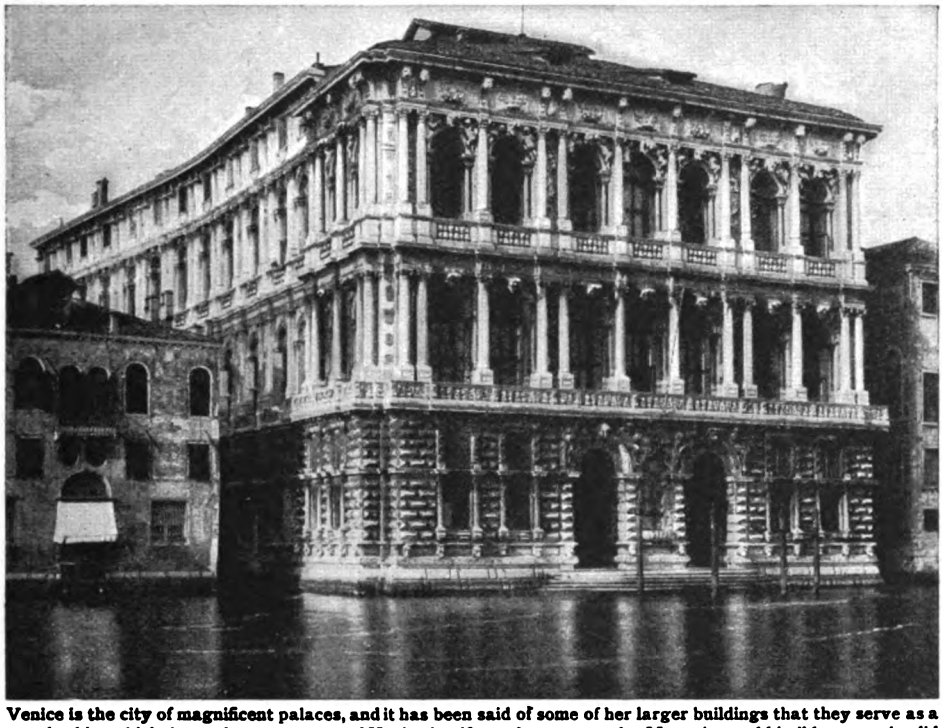
They worked together with him, and all the young artists of Venice who desired to become great in their art flocked to their studio to become pupils. Giorgione and Titian were of the number. Gentile Bellini painted scenes from the life of Venice; Giovanni Bellini painted religious subjects as Venice had never before seen them painted. Gentile painted portraits, and gained such fame that he was sent for by the Sultan of Turkey to paint his portrait at Constantinople.

The savage act of a cruel man which drove Bellini back to Venice

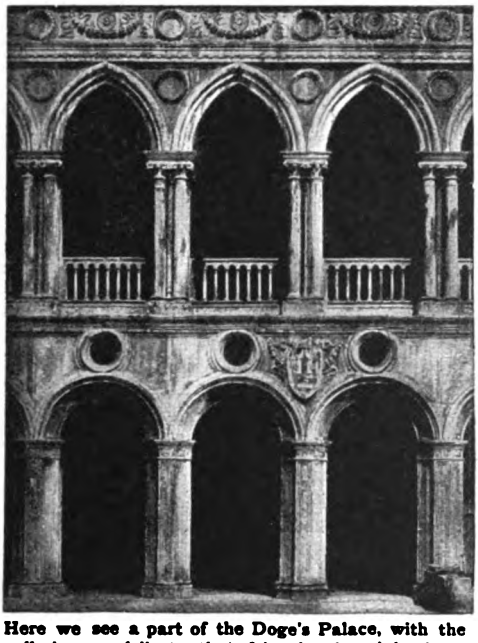
Gentile went and painted a famous picture of the cruel man who then ruled over Turkey. This wretch one day wished to show that Bellini had not correctly painted the head of John the Baptist after death, so he drew his sword and cut off the head of a slave standing near. So horrified was the artist that he never rested until he got back to Venice.

But a great change had now come over the art of Venice. An artist named Antonello, of Messina, appeared in Venice, taking with him a new art. He had learned from Hubert and Jan van

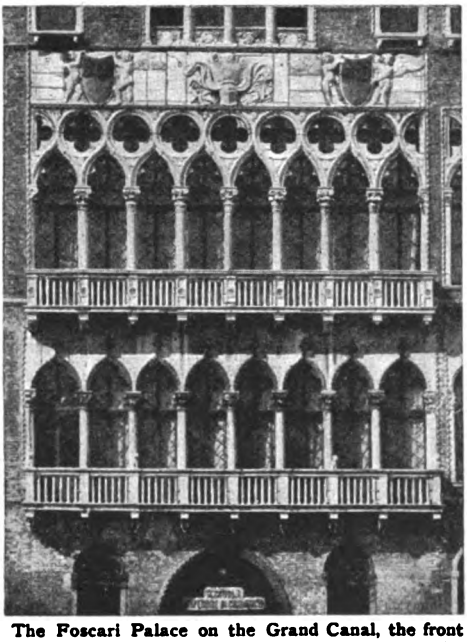
THE PALACES ON THE GRAND CANAL



Venice is the city of magnificent palaces, and it has been said of some of her larger buildings that they serve as a standard by which the ancient greatness of Venice itself may be measured. Men who could build on so splendid a scale can have had no thought of decaying fortune or declining power. The splendid Pesaro Palace, shown here, was begun in 1679, and took more than thirty years to complete. It is situated on the Grand Canal.



Here we see a part of the Doge's Palace, with the galleries so delicate that fairy hands might have fashioned them, and yet so strong that all the wear and tear of centuries has battered them in vain.



The Foscari Palace on the Grand Canal, the front of which is shown in this picture, is another of the glories of Venice, and a lasting monument to the men who made her beautiful in the days of her triumph.

Eyck, the great Flemish artists, their secret of painting with colours mixed with oils. Let us look for a moment at a scene painted for the stage of a theatre; it is done in distemper, the medium in which the artists of Venice had been working. Then let us remember one of the glorious oil-paintings at the Metropolitan Museum, which is the kind of work that Antonello introduced. It set all the people in Venice wondering.

How the precious secret of painting in oils became known in Venice

The story runs that Giovanni Bellini went in disguise to Antonello to have his portrait painted, solely that he might learn for himself the great secret. Whatever the truth of this story, we know that the grand secret was soon mastered in Venice, and that the Bellinis were the first to help make it famous by their work. Venice was now glorified by many brilliant works of the brothers. They had the happiness, too, to see young artists promising to become even greater than themselves growing up about them.

But the Venetian authorities feared that death would come too soon and carry off Giovanni Bellini before his work for them was done. Though they paid very poorly for the work, they loved his art, and were determined to get as much out of him as possible. They therefore decreed that he should work every day in one of the great state apartments which he was decorating, and that he should have assistants.

These young men had only four or five ducats a month as payment, and the great Titian was one of the workmen appointed as painters on these terms.

How Venice treated the mighty Titian, and welcomed Albert Dürer

The document stating the terms of his engagement refers to him with as little ceremony as if he were a poor man called in to whitewash a ceiling. He became one of the greatest painters of all time. His story appears on pages 777-8. The mighty genius of Titian could never have developed in the way that it did had not Jacopo Bellini and his two illustrious sons given a new turn to the world of art.

Gentile Bellini died in 1507, nine years before his brother Giovanni. Both of them had the happiness to meet Albert Dürer, Germany's greatest painter. Born at Nüremberg in 1471, Dürer had a hard struggle for education. His father was a poor goldsmith with a family of eighteen children, and Albert had for a time to support his aged mother and a brother as well as his own family. He worked like a slave to master the elements of painting. His father, bitterly disappointed that the lad had wasted his time by years of study of the goldsmith's art, for which he had no love, at last allowed him to adopt painting as his profession.

There was little money for Albert in Nüremberg, but elsewhere others made money by copying his designs and selling the copies as his work. These pirated copies reached even Venice, and it was to prevent this dishonest trading in his productions, and to sell works which were genuinely his, that Albert, in 1505, went to Venice. His paintings astonished the Venetians. They were amazed at the skill with which he painted a picture for the German chapel in their city.

How Albert Dürer showed his genius by painting a lock of hair

The younger men were jealous. Not so the Bellinis. Giovanni went to Dürer as humbly as if he had been an apprentice, and asked to see the German painter's work. He could hardly believe that he had painted some of the things said to have been done. Giovanni asked to see the brushes with which the work had been carried out. Even then he could not understand, so Dürer picked up one of the brushes, and, while the aged artist looked on, painted a lock of hair so much like nature and so beautiful that it might have been taken from a human head and laid upon the canvas.

Giovanni was delighted, and praised and honoured the young German, and gave him an order for his portrait. Dürer died at his home in 1528. A great painter and skilled engraver, he was also the father of etching, as well as one of the men whose art helped Venice forward in her efforts towards the glorious goal to which she was tending.

One of the first of the new school of artists to be influenced by the Bellinis was Vittore Carpaccio. He was born in Istria, about 1450, and lived seventy-two years. We have seen how the idea of painting scenes from *life* began to

TITIAN, THE POET-PAINTER OF THE WORLD

By many, the Italian artist Titian is regarded as the greatest painter the world has ever produced. It was the ambition of every monarch and prince of his time to be painted by Titian, and here we see the proud Emperor Charles V., on a visit to the artist, picking up the paint-brush which Titian has dropped.

Titian, who is here seen at work in his studio, has been called "the glory of a thousand years" and "the poet-painter of the world." His master touch makes the very canvas glow with a warmth divine, and his "Assumption of the Virgin" is one of the two or three finest paintings in the world. Titian lived in great magnificence at Venice.

take the place of pictures which had been painted again and again in the same flat old style. Carpaccio carried on the work in the noblest way. Some of the painters of his age took subjects from heathen books for their pictures. Carpaccio painted beautiful stories upon his canvases. His pictures told the story of the lives of saints and heroes; they were made to appeal to the mind and the soul, not, like some others, merely to the eye.

Like many other artists of that age, he was always comparatively poor, and we find a curious letter, written by him to a rich nobleman, describing a picture of Jerusalem which he wished to sell. The picture, he says, was 25 feet high and 5½ feet wide, and, in order that it could be inspected, he wished to send it to the nobleman, "rolled round a piece of wood." Fancy one of our artists having to send a picture to our Royal Academy rolled round wood instead of being packed flat!

A WONDERFUL ARTIST WHO DIED YOUNG IN A WONDERFUL AGE

Another great man arose in these days. Soon after the birth of Titian—that is, in 1477—Giorgione was born. As Giotto perfected the changes introduced by Cimabué, his master, into Florentine art, so Giorgione ennobled the art schemes of his masters, the Bellini family. Giorgione not only enriched the city by his wonderful frescoes and other paintings, but had a most powerful influence upon the artists of his own day—upon Titian among them, and upon the artists who followed. Unlike several of the men of his day, Giorgione did not attain a great age, dying, all too soon, when only thirty-three.

This was a wonderful age for Venice. Every rich man was willing to employ artists. They may not have paid well, but there was no very serious competition. And we find Giorgione, and Titian, and others, painting lovely works on articles of furniture, and other artists rivalling the goldsmiths in the splendour with which they decorated the outside of buildings with the glories of the brush.

Much talent was wasted in this way. Some of the artists would do anything for money. Titian was, perhaps, the most grasping of them all. We cannot but admire his works, but the nature of the man was in some respects detestable. This mean nature was never more apparent than in his treatment of another great man, Tintoretto, to whom we now come. His real name was Jacopo Robusti, and he was born at Venice in 1518, and died in 1594. His father was a dyer—a *tintore*—and so they called Jacopo, his son, Tintoretto, or Tintorettino, meaning "the little dyer." The clever boy was a born artist.

THE BOY WHO DAUBED THE WALLS AND BECAME A FAMOUS PAINTER

He used to dabble in his father's dyes, and to splash the colours all over the walls and furniture until his parents must have found him a nuisance. Seeing which way the lad's genius was inclined, the father took him to the studio of Titian. Jacopo's apprenticeship lasted but a few days.

Titian went into the studio one morning and saw, lying on the floor, papers covered with drawings. He picked them up, and asked who had done them. Little Tintoretto shyly confessed that he had. Titian saw that they were the work of a genius; he saw that this boy might soon become a rival to himself. He left the studio at once, and that same day had the poor boy turned out.

It was a shameful thing, but brave young Tintoretto was not to be beaten. His life became a miracle of activity. He set before himself two models—Michael Angelo for design; Titian, his cruel master, for colour. Wherever he could see a work by either of these two he studied it. He copied antique statues. He made numberless drawings to perfect his style. He studied the human frame as a whole and in its various parts.

HOW TINTORETTO PAINTED PRICELESS PICTURES ON THE WALLS OF HOUSES

He made models of wax on which to hang draperies for the figures he meant to paint. He copied tombstones and bits of broken statuary. He studied the methods of every artist in every studio into which he dared to peep. He went down into the square where the poor painters worked who painted common furniture and cabinets for sale, and studied how they got some of their effects. He followed the work of architects. He used to beg builders to let him decorate houses which they were erecting.

MEN WHO MADE VENICE BEAUTIFUL

Some of the greatest painters the world has ever seen helped to make Venice beautiful, and among these was Albert Dürer, a German artist, whom we see here in his studio at Venice. He went to Italy to improve himself in painting, but the Italian artists learnt much from him. He painted a fine picture—"The Martyrdom of St. Bartholomew"—for St. Mark's, but this was afterwards bought by an Emperor of Germany and removed to Prague.

Paul Veronese was one of the Italian artists who learnt much from Albert Dürer, and some of his best work is to be found in Venice. The frescoes painted by him on the ceiling of the Church of St. Sebastian are called by the Italians "the glory of Veronese." Here are two portraits of Veronese painted by himself. The first shows him as a hunter, and the other is from his great picture of "The Feast in the House of Simon," spoken of in the Gospels.

Once he painted designs all round a clock which the builders were erecting in a tower. Another builder was putting up a new house, and Tintoretto insisted on painting the walls with lovely frescoes, simply for the cost of the materials he used. He would do paintings for chapels and churches and other buildings for practically nothing.

A MASTERPIECE THAT WAS PAINTED ON A CEILING IN A FEW DAYS

He did anything and everything to perfect his art and make his name known. He worked with marvellous speed, and, of course, the effect was not always good. But in time he made a very great name, and became one of the five greatest painters of all time. One story must suffice to show his passion for work and the marvellous way in which he carried it out.

The ceiling of the San Rocco School was to be decorated with a painting, and the artists of Venice were asked to send in sketches for the work. There were not many days for the preparation. The other artists made their rough plans. Not so Tintoretto. He had the space measured, and, with that zeal and speed which nobody could match, he painted his whole picture, and had it secretly fixed up on the ceiling and covered over.

When the day of trial came, the others showed their sketches, while Tintoretto stood by. At last he drew away the linen covering the ceiling, and the company saw his splendid picture already fixed.

Everybody was amazed. The authorities, when they recovered their breath, protested that they had asked only for designs, not for a finished picture.

THE WONDERFUL PAINTING THAT MADE THE AUTHORITIES OF VENICE ANGRY

The other artists, however, examined the work, and, seeing how great and exquisite it was, they withdrew from the competition. The authorities, however, were very angry indeed, and still grumbled furiously.

"Oh, very well; there is the picture!" said Tintoretto. "If you will not pay me for it, then I will make it a present to the saints."

After that the city authorities calmed down, and, deciding that the work was one of rare merit, they at last agreed to pay the artist fairly for it.

The last of the greatest Venetian painters was Paul Veronese. He was born in 1528 at Verona, whence his title, his real name being Caliara, or Cagliari. He lived in Venice from 1555 till his death, in 1588. His pictures were characterised by the brilliance of colouring proper to works of the great Venetian school, but he had caught the spirit of painters in Rome, and gave to his work more dignity, grace of pose, and ease of movement than had been possible before his day.

Paul Veronese was a painter more for the palace than the church. His scenes were scenes of splendour, of great space and riches and luxury, so that it has been said that one of his paintings would convert a garret into a palace of vast size and delight. He was a great worker, but different in type from Tintoretto, taking careful pains with all that he painted.

THE GLORY THAT HAS GONE FROM VENICE AND THE GLORY THAT REMAINS

In the Louvre at Paris there hangs his picture called "The Marriage Feast at Cana," showing no fewer than 160 portraits of people who lived in Venice in his day. The strange thing is that this painter of splendour and palaces should, like Tintoretto and Titian, have painted frescoes on the outside of houses which faded away and disappeared under the influence of the weather while the artists themselves were still alive.

With the death of Paul Veronese, the sun of Venetian art set. But the afterglow has lighted the world for more than three hundred years, firing the enthusiasm of all the artists who have lived since.

While the glory of Venice as a maritime power, holding a great part of the commerce of the world in her hand, and forming a link between the East and the West, is departed for ever, the more lasting glory which attaches to her as a patron of the highest and best art will never die. So long as Venice and her pictures last, they will remain the greatest treasures in the world, guiding and inspiring the artists who see them, and making our modern artists realise the influence which those beautiful and wonderful pictures have had upon the art of the whole world from the day that they were painted until the present.

The next Men and Women begin on 1301.

THE FAITHFUL SENTINEL OF POMPEII

When the city of Pompeii was destroyed by a burning mountain, just after Jesus was born, a brave soldier stood at his post to the last, watching death come towards him. When, 2,000 years after, the diggers found the ruins of the city buried in the earth, they found the soldier's body lying where he had kept watch. Sir Edward Poynter has painted this picture of the sentinel who was "Faithful Unto Death," and it hangs in the Liverpool Art Gallery.

HOW THE DAISIES GO TO SLEEP

Flowers, like all living things, must go to sleep sometimes, and most flowers sleep at night, as we do. Flowers and plants have a wonderful way of living on the air, which they change into food. All through the day the flowers take in their food from the air, and at night, while sleeping, they give back some that they have taken, so as to keep the air fit for our own use, as explained on page 1265 and also on page 227. Flowers take most of their food in the day and grow at night while asleep. These pictures show the same daisies awake and asleep.

DO FLOWERS SLEEP AT NIGHT?

CONTINUED FROM 1134

PLANTS do go to sleep at night for several interesting reasons. Animals depend upon plants and trees for their proper air, and plants and trees depend upon animal life for theirs. Plants take in the carbonic acid gas from the air, using the carbon and giving out the oxygen, thus forming material for the life of animals. Animals—men and beasts—in return, breathe out carbonic acid gas, and so keep the air fit for the life of plants. We could not live without plants, and plants would die but for us.

But when the sun is shining, or so long as light lasts, the plant is so busy taking in its store of carbonic acid gas that it has not time to put forth the oxygen due from it. When the daylight dies away, the plant ceases to take in the carbon, and, while sleeping, gives off its oxygen. A flower takes its food in the day and grows at night. It becomes heavier during the day, but lighter during the night, when it is giving off and not taking in anything.

DO FLOWERS WAKE UP IN THE NIGHT?

Flowers do not wake up in the night as we do if our sleep is disturbed, but we must not suppose that plants sleep only at night. Some sleep during the day and wake up in the evening. Pollen has to be brought to many plants by insects. Some insects sleep by day and work by night. These are they which visit the night flowers, carrying the pollen which they need.

Then there are early risers among the flowers. The crocus, for instance, wakes early and goes to sleep soon after midday. Plants and flowers seem to know as well as the wisest of human beings what best to do. Some are so delicate that they cannot bear the glare of the hot sun, so they go to sleep before the heat becomes too great for them, closing their petals and protecting their sensitive parts. Others cannot bear much moisture or cooling, and they go to sleep and keep snug until all is safe again.

For the most part it is at night that the plants sleep. The flowers close their petals with wonderful neatness; the leaves curl; some stalks hang limp, while the stalks of others, in order to let out the oxygen, have to keep erect, as we do when we wish to breathe deep breaths. We can learn a good deal by watching the daily life of the common wild daisy.

CAN FLOWERS TALK TO EACH OTHER?

No. Flowers are wonderful in many ways, and they can do many things which even men cannot do; but they

cannot talk to each other, either by words, or by expression, or by any other kind of movement. Only the animal world can do this, because only in the animal world has life developed what is called a nervous system.

No plant has a nervous system, even of the humblest kind, much less anything like a brain. We know that many of the lower animals can, in effect, talk to each other, but all of these have some kind of a nervous system; and if we go down in the scale of the animal world, until we reach those creatures which have no nervous system, we find that they cannot express themselves to each other by any means at all.

So much depends upon the power of talking, without which men and women would not be men and women, that this is perhaps the most important thing that the nervous system makes possible. Of course, when we say "talk," we do not mean only talking with the voice. A dumb person, who can only talk on the fingers, may be far cleverer and wiser than a man who is not dumb, but never says anything worth saying.

WHY CAN WE SEE THROUGH GLASS?

Well, it all depends on the glass. It is very easy, indeed, to make glass that we cannot see through, and it was a very useful discovery when men learned how to make glass which can be seen through. We must not fancy that the Romans, for instance, had glass window-panes. If we compare two kinds of glass, one frosted and one clear, we find that a certain amount of light comes through both kinds; they both let a certain amount of light come through, but in the one case we can see what is on the other side, and in the other case we cannot.

Anything like frosted glass, which lets light through without letting us see what is on the other side, is called *translucent*, which simple means *through-shining*. But anything like a window-pane, which lets us see what is on the other side, is called *transparent*, which means *through-appearing*. When the waves of light pass through a translucent thing, like frosted glass, they are all twisted and broken and mixed. That is why, though we can see some light coming through, we cannot make out things on the other side. But transparent glass lets waves of light come through it almost exactly as they came in, so that sometimes we are not sure whether the window-pane is there or not.

WHY CAN WE SEE THROUGH WATER?

Water is much the same as glass in this respect. If there be no solid specks of anything hanging in the water, and if the water be still, it is very fairly transparent. Neither water nor glass nor anything else, I think, lets through absolutely all the light that comes to it. It keeps back at least a little, just as the air itself does with the light of the sun. But still, if the layer of water is not too thick, we may be able to see a long way through it, which is just another way of saying that the light can come through it a long way.

But when you read the last question, I am sure you understood that a thing is not either quite transparent or only translucent, but that we may have any amount of stages in between. So if we go to an aquarium, and look at the fishes or other animals living in the water, we shall see that in one case water may be very clear and transparent, and in another may be only half transparent. There are really all degrees possible—things quite or almost quite transparent, things not quite so transparent, things translucent but still letting us see in a dim way what is behind, other things which let us see nothing behind them and still let light through, and so on—things which let less and less light through, until at last we have things which are not translucent at all and let through no light. These we call *opaque*. The front part of the eye, considering the kind of stuff of which it must be made to be alive, is the most wonderfully transparent thing.

WHY CAN WE SLEEP MORE QUICKLY IN THE DARK THAN IN THE LIGHT?

Everything in the world lets more or less light through it if it is thin enough. Our eyelids must be thin because we have to hold them up when we see, and if they were thick they would be so heavy that it would be hard work to keep our eyes open. It is hard enough work sometimes to keep our eyes open even as it is, when we are sleepy, and our eyelids are apt to drop. Thus, being so thin, our eyelids are very far from being opaque. If they were as opaque as the black cloths that a photographer uses, then we

should go to sleep quite as easily in the light as in the dark, for directly we shut our eyes we should practically be in the dark. But, in fact, our eyelids let a good deal of light through, as we can tell at once if we turn to the window with our eyes shut; and this light helps to keep our brains awake.

CAN OUR EYES SHUT OUT ALL LIGHT?

No. Do not think, however, that we are entitled to blame our eyes and eyelids, and to say that they are not what they should be. In the first place, we are really meant to sleep when the night comes and there is no light, so that it would not matter that our eyelids were capable of letting through a little light. And, in the second place, our brains have learnt a way of avoiding the light as much as possible. For, whenever we shut our eyes, we roll the eyeball a little upwards. This means that not merely have we let down a curtain, but that, as there is just a tiny chink where the curtain meets the lower eyelid, the part of the eyeball where the light comes through is turned up and away so as not to be opposite that chink. Do you not think this is beautiful?

Look at the window with your eyes shut, and then, instead of merely shutting them, screw them up as tightly as you can. This cuts out rather more light, but by no means all. Keep them screwed, and turn your back on the window, and it gets darker still. This is a little experiment with three stages which we can make in three seconds.

WHAT IS LIGHT?

Men have long known that light is something which moves from place to place. It takes time for light to travel. The question, then, was to find out what was moving. Newton, one of the greatest men who ever lived, thought that light was a movement of tiny specks of something through space—as if a candle or a star were sending out a shower of tiny particles from itself in all directions. He thought that when these struck the eye they caused the feeling of light, just as a shower of raindrops on the hand causes the feeling of touch. This belief as to what light is was very long held. Men believed it, not so much because it was proved, as because Newton believed in it. Yet we now know that it is not true. There is a great lesson here. No greater mind than Newton's was ever turned to questions like these, yet even Newton could be wrong, and it was wrong to believe it on his authority alone. There is no authority but Nature itself, and everything that men say, however great they are, must be tested. We now know that light is a wave motion in something which has never been seen and never will be, though it exists everywhere, and is called the ether.

CAN WE STORE SUNLIGHT?

When light falls on the earth it is usually changed into other things. Its power is never turned into nothing, but it is very often wasted. It is a great pity that we do not try to store sunlight, so that we may use it as we need it. We shall no doubt learn to do this some day. Meanwhile, the green world around us *is* storing sunlight. If anyone said to you that there is stored sunlight in coal, you would wonder what he meant, but it is true. The coal is made from the bodies of plants that lived long ago. They lived by sunlight, and turned its power into the making of their own bodies. That power is still in the coal, as we find when we burn it. The light of the fire is sunlight that has long been stored in the earth. Everyone who plants a tree, then, is storing sunlight. Some day, when everyone becomes sensible, we shall not waste great tracts of land, as we do now, but shall use them for storing sunlight by planting trees upon them. Just now scarcely anyone cares about these things, and I do not like to think what *our* children, when they grow up, will think of us who care so little for their interests. For every tree that is cut down, one should be planted somewhere.

WHY DOES THE FACE CHANGE WHEN WE THINK HARD?

Underneath the skin of the face there is a great number of small but wonderful little muscles. These have various uses, such as to open and shut the mouth, raise the eyebrows, and so on, but they are all governed by a single pair of nerves which come from the brain, and which are called the facial nerves, one for each side of the face. These nerves are closely connected with the brain, and so it is that almost

everything which happens in the brain affects them, and may show its signs in the face by movements of the muscles which these nerves control. It is not only when we think, but also when we feel, that the face changes. This is best shown in children.

But it is possible in some degree for us to control the movements of our faces, so that, for instance, we may look happy when we feel sad. Grown-up people usually learn to control the movements of the face; but this is largely a matter of habit. People's faces do not tell nearly so much in England as, for instance, they do in Italy, where people allow their faces to show what they feel and think, just as a child does. When a person's face expresses his thoughts and feelings, we say that it is "expressive," and it is rather nice to meet someone whose face is not like a mask that cannot move.

HOW DID MEN LEARN TO TALK?

Anything that expresses to someone else what is going on in our minds is, in a way, a sort of talking. We can tell by a baby's face, long before it can talk, something of what it wants and feels. We can also tell by a baby's cry a great deal of what it wants and feels. Now, that cry is made with its voice, just as talking is made, and is really a sort of untaught talking. It is made in the same way, and it serves the same purpose. Different kinds of cries have different meanings. Then, also, we not only move our faces and make sounds with our voices, but we move our hands and arms.

In some parts of the world these movements or gestures have definite meanings, and people can talk to each other in this way without saying a word. This is called "gesture language." Just in the same way, different kinds of sounds—and that is all words are in themselves—can come to have special meanings of their own; and that is what happens when we talk. The simplest words, like "mamma," are those which a baby will make all the world over when it first tries to talk. You only have to breathe out through your mouth and separate your lips twice to say mamma. This is the baby's name for its mother in all languages, or something very like it; and if men forgot how to talk, the new babies would soon make a beginning with "mamma." I think it is beautiful that language began in this way.

WHY ARE THERE SO MANY LANGUAGES?

Very many words really begin in imitation of sounds. You know words like buzz, whir, pop, and so on. People who study language know that far more words begin in this way than most people think. Apart from that, however, we often have to make words simply by inventing them. The word does not matter as long as everyone is agreed as to what it means. A word is only a name. You would still be you if you had been called Tom instead of Harry, or Monica instead of Marjorie. Shakespeare says in one of his plays:

> What's in a name?
> A rose by any other name would smell as sweet.

So in different parts of the world different names have been invented; but, really, different languages are a thousand times more alike than we think—Latin, Greek, Italian, Spanish, Portuguese, and French are really close relatives, because the different peoples who speak them are in large measure descended from the same people. So, nowadays, we can often learn the history of a nation by its language. English is probably the finest language in the world for all purposes, but it is a very funny mixture. "Mixture," for instance, is Latin, and so are tens of thousands of English words. Many others are a sort of French, and many others Anglo-Saxon, which is very like German. We say *father*, the Germans, *vater*, the Romans said *pater*, the French say *père*, and so on. All these words are really the same.

WHY DO LANGUAGES CHANGE AS TIME PASSES?

Every language changes, whether people like it or not. New words are made, and old ones are forgotten. The English we speak and write is very different from Shakespeare's and Chaucer's. Languages have bad periods and good periods. Everyone agrees that the English into which the Bible was translated was the best English there has ever been. These things are partly matters of fashion. Everyone who writes a language does something to make it better or worse:

and everyone who reads bad English and does not mind it is encouraging people to write bad English, and so make the language worse.

ARE NEW WORDS MADE FOR NEW THINGS?

Yes; new words are made for new things; and so it is that language is changed more quickly in countries where people write and read a great deal, and where new things are made and done. Then people always want to save time in speaking and reading and writing, so they get shorter ways of saying things, and the tendency of all words is to get shorter. French shows this very much; for instance, in *père*, the French word for father, they have dropped the *t* of pater altogether. We have done the same with *I*, whilst the Germans still say *Ich* and the Romans actually took the trouble of saying two syllables, *Ego*. Then the Romans said *est* for *is*, and the Germans still say *ist*. The French keep the letters *est*, but they only pronounce the first of them. The modern Italians have not only stopped pronouncing the *st*, but have stopped writing them, and their word for *is* is simply *e*. But if you spent your whole life collecting cases like this, you would not come to the end.

CAN ANIMALS TALK TO EACH OTHER?

People used to think that only human beings could talk to each other, and there is no doubt at all that no other creatures can talk one thousandth part as well as we do. But no one who knows animals now doubts for a moment that many kinds of animals can talk to each other. Only it is not our kind of talking. Monkeys, for instance, make many kinds of sounds with their mouths which have different meanings; only they do not express ideas or make assertions that the earth is round, but they express their feelings. A baby expresses various feelings with its mouth long before it can talk, and so many animals can express fear, joy, anger, and many other feelings with their voices, and their fellows can understand them. That is talking of a kind.

But though monkeys probably come nearer to us in talking—though still very, very far away—than any other animals, yet many insects, which are very simple and humble creatures compared with monkeys, can talk wondrefully in their own way. I mean especially the social insects, like ants and bees and wasps. If they could not tell each other what they felt and wanted, they could not live together in societies as they do—societies, remember, from which human beings have a lot to learn yet, societies in which very few children die. The insects have long "feelers," with which, as it seems, they can touch each other, and say what they want to do or how they feel. But I could write a book on this, and I must stop.

WHY CAN PARROTS TALK, AND NOT OTHER BIRDS?

It is not quite true that other birds cannot be taught to talk, but it is quite true that some birds will learn and others will not, and you are quite right to ask what makes the difference. I think the way in which the bird hears goes for a good deal. If you do not hear properly, then you cannot imitate the sounds that other people make. That is why many poor deaf children are dumb. It may be that parrots have better ears than many other birds.

I think it is also because these birds have brains which help them to distinguish sounds better. You see, talking is really a matter of the brain, far more than of the teeth and tongue and lips. But I do want you to understand what the talking of the parrot really is. It is utterly different from the first talking of a child as it learns, though very likely the child does not talk as distinctly as the parrot does.

But when the child talks it means something, even though, very likely, you cannot make out what it means. I believe that the parrot never means anything because it never understands what the words it hears mean. I am sure that the parrot is just like the wonderful machine called a phonograph. You talk into it and it talks back at you, but it understands nothing. Therefore, the talking of the parrot, though it is clever in a way, is really less clever than the way in which insects tell each other what they want.

WHAT LANGUAGE DID JESUS SPEAK?

There is a great group of languages which are all classed as Semitic or Jewish. Amongst these are some which are named after the old word for Syria—the word Aram. It was one of these Aramaic languages that was spoken by

Jesus, for before his time Aramaic had become the language that was spoken in Palestine. We can learn a lesson here. The Aramaic language itself is not a beautiful one to hear. The words are not beautiful so far as their mere sound is concerned. Nor is this what would be called a highly developed language.

It is far from being so. Indeed, the language which Jesus spoke was humble, and so in keeping with everything else that we know about His life; but in this humble language, with its rather ugly sound, He said the noblest and most beautiful things that have ever been uttered on the earth; and in whatever language they are now spoken, whether ancient Aramaic, or a harsh modern language like German, or a beautiful modern language like Italian, they are no less beautiful, and no more—for more they could not be. It is not the sounds that matter, but what is said by them.

ARE THE STARS REALLY CLOSE TOGETHER?

The stars are so far away that our eyes do not help to tell us their distances. Sometimes we may see a star quite close to the moon, seeming side by side, yet they may be millions of miles away. There are seven stars which seem so close, they are sometimes called the "Seven Sisters"; astronomers call them the Pleiades. The Pleiades are really what they look like—a star cluster. Of course, when we say "close together" about stars, we mean one kind of closeness, and when we say "close together" in the atoms of a drop of water, we mean another kind of closeness.

The "Seven Sisters" are doubtless thousands of millions of times farther away from each other than the earth is from the sun, but, as compared with other stars, they are close together. Even on the brightest night many of us are only able to see six of the stars in this cluster, and there is an old Greek story about the seventh being lost—the lost Pleiad. But with the telescope, or, still better, with a telescope that has a photographic plate in it, we discover that the six or seven stars that we can see are really only the brightest stars of a great group which is actually to be numbered by tens of thousands. There is nothing in the whole heavens quite so wonderful as this mighty cluster of stars or suns. In all ages men have wondered at their beauty. Job, for instance, did so, thousands of years ago; look at the 9th and 38th chapters of Job.

WHY IS IT THAT THE SEA NEVER GETS ANY LARGER?

This is a question about which men have always wondered. Thoughtful children and grown-up people will be asking these questions again in a thousand years. Let me tell you how it was asked and answered by the Hebrew preacher long years ago (Ecclesiastes 1. 7): "All the rivers run into the sea; yet the sea is not full; unto the place from whence the rivers come, thither they return again." So we see that this question is answered in the Bible. What happens is that the power of the sun sucks up some of the water from the sea, and then it is poured back upon the land in the form of rain, and that makes the rivers. Besides this, in many parts of the world the sea *does* get larger, because it wears away the land; but in other parts of the world the land extends and the sea gets smaller.

WHAT MAKES THE SEA SALT?

The sun sucks up the water from the sea, but it sucks up nothing else. The salt of the sea has been brought to it by the rivers. These, as they come down from the land, melt away from the land anything that water can melt, and this they carry into the sea. River water is salt, too, only so very little salt that we notice nothing. Sea water is so much salter chiefly because it contains all the salt that the rivers have been carrying down to it for ages past. One of the commonest kinds of salt in sea water is ordinary salt that we use at table, but there are a great number of other kinds too. We must remember that, though table salt is the only kind of salt we usually think of, yet "salt" is really only a general word for a large number of compounds, like each other to some extent, yet different. It is a mixture of a great number of these that helps to make the sea salt.

IF RIVERS MAKE THE SEA SALT, WHY ARE RIVERS FRESH?

The river is not really fresh, but a little salt, and it is largely because the river is a little salt that the sea is very salt. It is true that river water may taste

fresh to our mouths, but that is because we are not accustomed to the taste of water that *really* contains no salt. If we taste, one after the other, two tumblers, one containing river water and one containing sea water, we should certainly know which was which; but if we took two tumblers, one containing river water and the other containing water which contains no salt, and none of the dissolved gases which help to make salts, then you would find it just as easy to tell which was which as in the first case, because you would taste the salt in the river water.

WHY DOES SALT MAKE US THIRSTY?

The reason why table salt makes us thirsty is that we always require a certain proportion of this table salt in our blood and in every part of our bodies; and this proportion, it is very interesting to know, is just about the same as that in the sea, where we suppose that life began. But we must not have more than this proportion. If, then, you take a great deal of salt, it becomes necessary to get the saltness of your blood down again to just the right amount, and the plain and simple way of doing that, as our body perfectly understands, is to get more water into it; and so the wise body says, "I am thirsty." There are ever so many other examples to show how wise our bodies are in what they ask, provided that we treat them properly and do not try to cheat them. All sorts of strong-flavoured things make us thirsty, besides salt, and for a similar reason. It is not good to have these things in the body unless they are sufficiently mixed with water. They would hurt the body, just as strong medicine will hurt your mouth and throat unless you add water to it. Children should not take these strongly flavoured things, like mustard and pepper and pickles, and I think that older people are wise if they take very little of such things.

WHY DO THEY SAY 13 IS UNLUCKY?

The first thing to say in answer to this question is that 13 is not unlucky. Whoever says it, speaks nonsense. This is what we call a superstition, meaning something which is believed just because someone else has said so, and because people have no faith in God or in Nature. Many superstitions can be traced to something. Some people say, for instance, that 13 is supposed to be unlucky because that was the number of those who sat down at the Last Supper. Perhaps Friday is thought unlucky for a somewhat similar reason, because Friday was the day of the Crucifixion. Then other things are supposed to be lucky, as, for instance, horse-shoes. Other people think that it means something if we see a black cat; that it is unlucky to look at the new moon through glass, and so on.

Many students have spent much time in tracing these superstitions back to their beginning. Long ages ago, when men were savage, and also to-day amongst the few savage peoples that still remain on the earth, we find an endless number of these superstitions. No one would ever listen to them again who had read a few books about savages, and had learnt how wretched these false beliefs make the lives of savages—how many are killed and tortured and frightened because of some superstition or other. But we have not the excuse that savages have, for we profess to believe in a wise and good God, who sees and orders everything that happens on the earth.

WHAT IS LUCK?

There is such a thing as what we call chance, though this, too, has its laws. It may chance, or happen, that you take the second turning instead of the first, and so meet one who becomes your best friend; or that you forget your purse, and so lose a train which is wrecked. But these things do not make up the most of human life. The really lucky thing is to be wise and healthy, and do your duty. One of the wisest men who ever lived was a lame slave called Epictetus, who said, "The mark of a fool is this: he never expects from himself profit nor harm, but from things outside him."

The man who fails in the world is the man who believes in luck, and is always complaining of his own bad luck. He is right—*if* by bad luck he means that he will not work or will not keep his word, or will not stop drinking. It is ourselves that our fate depends upon, more than anything else. If you are loved and happy when a child, if you are taught the things worth learning, then you are almost certain to be lucky. If you sit down 12 at table and eat and

drink too much, that would be an unlucky meal; if you sit down 13 and eat and drink what you should, that would be a lucky meal. No one who is afraid to sit down 13 at table really believes that there is an All-Wise Father. How could he?

WHY CANNOT WE SLEEP WITH OUR EYES OPEN?

To begin with, one reason why our eyes are shut during sleep is that it needs effort to keep our eyes open. When we get sleepy, we relax that effort, and our eyelids drop of their own weight—"softly as tired eyelids upon tired eyes." So that is one answer to the question. We cannot sleep with our eyes open because we cannot hold our eyelids up when we are asleep, and I think that is probably the answer you wanted. But another question is, Why would it keep a man awake to hold his eyes open in the light? (if you held them open for him in the dark he could sleep with his eyes open, though, if you prevented him from winking, they would get very uncomfortable and dry). The reason why light keeps us awake is that it excites our brains, and when we want to go to sleep, of course, one of the first things we have to do is to shut our brains off from the outside world by darkness and by silence.

So, you see, there are two answers to your question—one is that when we are asleep we cannot hold up our eyelids any more than we could hold both arms up in the air, and the other is that light keeps the brain awake.

DO FISHES SLEEP UNDER WATER?

Every living creature has its time of rest. Even microbes rest, and plants, and certainly fishes. The answer to your question, then, is yes; only there is this to be remembered always. When we see a cat asleep, there is no doubt about it, and the difference between a sleeping and a waking cat is very much the same as the difference between a sleeping and a waking child. But the difference between a sleeping and a waking fish is not quite the same. I dare say the sleep of the fish is just like the sleep of the cat or the sleep of you and me, but the waking of the fish is very different, and is very much nearer its sleep than your waking is to your sleep. What I mean is that the fish has such a poor, feeble glimmer of a mind—fishes are really very stupid—that even when widest awake it is still half asleep, compared with what you and I are when we are awake.

DO FISHES SHUT THEIR EYES?

No; fishes do not shut their eyes, and we have already seen that it is quite possible to sleep without the eyes being shut if it were not for the trouble of keeping our eyelids up. Now, an animal cannot shut its eyes unless it has something to shut them with, and the only things that can shut eyes are eyelids; and all the ordinary common fish do not have any eyelids.

They are not the only animals like this. If you will look at the snakes in a Zoo for a minute or two you will notice that they always seem to have their eyes wide open with a fixed stare, although they may appear to be, and perhaps are, fast asleep. This is because the snakes, like the fishes, have no proper eyelids which they can close. But there can be no doubt that when fishes rest, for instance, at the bottom of a pond or river, they sleep in the usual way, only they sleep with their eyes wide open, simply because they cannot shut them.

WHY ARE SOME FISH CAUGHT IN RIVERS, AND NOT IN THE SEA?

I think you might almost as well ask why is it that buffaloes live in America and lions in Africa, and Highland cattle in Scotland. The whole earth and the whole sea are full of life, but different creatures live in different places. You will not catch any sardines if you fish off the pier on your holidays, and you will not catch any mackerel in a river. There are some fishes which live in the sea and some which live in fresh water; and in the sea there are so-called shore fishes and deep-sea fishes. There are also fishes which are specially fond of the mouths of rivers, where the water is not fresh, but is not so salt as sea water.

Then there are certain fishes—such as the salmon—which begin their lives in rivers, spend the summer in the sea along the coast, and in the autumn travel up the rivers again in a way which can only be described as marvellous. There are many names for salmon at different stages of their lives.

The next questions are on page 1365.

THE POETRY OF COMMON THINGS

CONTINUED FROM 1126

THERE is hardly any end to the subjects with which poetry may be concerned, since poetry is as varied and extensive in its range as life itself. It is life in song. We have not, therefore, attempted to go further in these little lessons than to mention the chief departments of poetry, and we have already covered most of the field. References to the work of different poets will be found in the CHILD'S BOOK OF MEN AND WOMEN, where we deal with the writers of the great poems; while all the poets who are not important enough to come under that description, but have written verses worthy of being included in the CHILD'S BOOK OF POETRY, are noticed as their poems appear.

What remains for us to remark is the fact that great events are not always needed to furnish the poet with a theme for his muse. And here we may mention that the "poet's muse" is an expression derived from ancient times, when spirits or goddesses were supposed to watch over and inspire writers. These goddesses were called "the muses," and the ancient poets always began their poems by calling upon the Muse of Poetry to inspire them. Homer begins the "Iliad" thus:

Achilles' wrath, to Greece the direful spring
Of woes unnumbered, heavenly goddess, sing!

Assuredly the poet's muse does not depend upon the stirring times of war for inspiration, and that for the reason so well expressed by Milton in the famous lines:

Peace hath her victories
No less renowned than war.

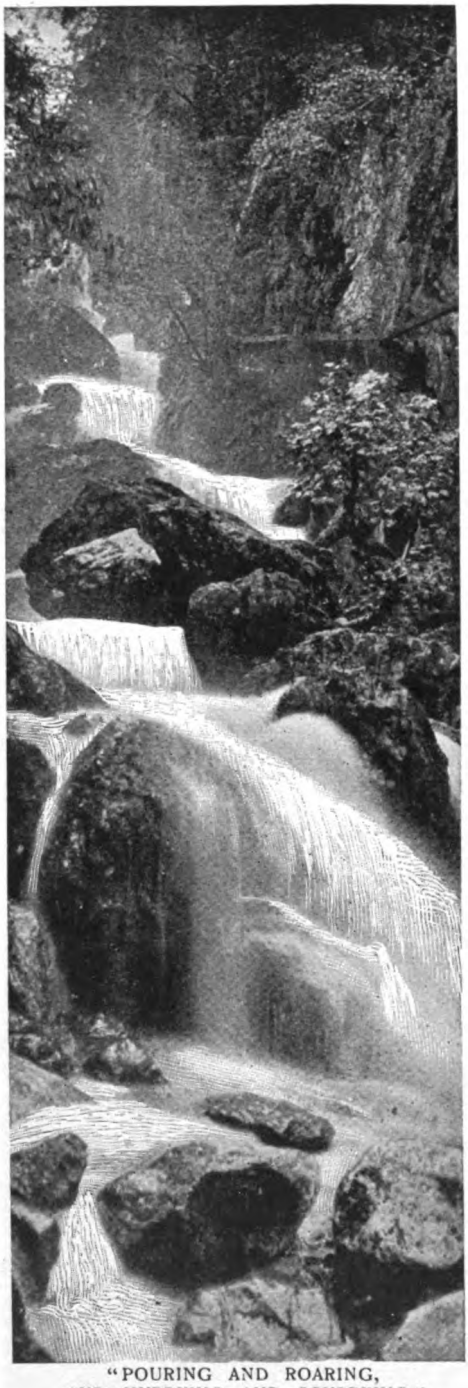
The pages of the CHILD'S BOOK OF POETRY abound in beautiful poems that derive their interest entirely from daily life and the common things around us. There is poetry in everything, if we have only the soul to search it out. There is poetry in the common horse, working out its laborious life in the city streets, as well as in the Arab's steed in splendid flight across the plain. There is poetry in the meadow, with its buttercups, its lambs, its gentle streams. There is poetry in the old armchair, the grandfather's clock, the kindly blue smoke arising from the hearth of the old village home. All common things are beautiful in the eye of the poet, who loves his fellowmen and the quiet ways of life; and all these things are celebrated in English poetry, which is remarkably rich in praise of the human affections.

After all, these are the enduring memories—the house we played in as little children, the friendly cat and dog, the fire in the old grate where we used to see such wonders, the old chair, the flowers at the window.

When we have concluded these little studies of poetry, the BOOK OF POETRY itself will be continued, as the young reader will have received sufficient assistance to enable him or her to take a serious interest in the poems which are reprinted in it, and to understand them.

THE CATARACT OF LODORE

The Falls of Lodore are in the English lake country, not far from the home of Robert Southey, who wrote this poem when he was Poet Laureate. "The Cataract of Lodore" is not of a high order as poetry, but as an exercise in rhyme, imitating the movement of the water, it is very clever.



"POURING AND ROARING,
AND HURRYING AND SCURRYING."

How does the water come down at Lodore?
My little boy asked me thus, once on a time,
Moreover, he task'd me to tell him in rhyme;
Anon at the word there first came one daughter,
And then came another to second and third
The request of their brother, and hear how the water
Comes down at Lodore, with its rush and its roar,
As many a time they had seen it before.
So I told them in rhyme, for of rhymes I had store.
And 'twas in my vocation that thus I should sing,
Because I was laureate to them and the King.

From its sources which well
In the tarn on the fell,
From its fountain in the mountain,
Its rills and its gills,
Through moss and through brake,
It runs and it creeps,
For awhile till it sleeps,
In its own little lake;
And thence at departing,
Awakening and starting,
It runs through the reeds,
And away it proceeds,
Through meadow and glade,
In sun and in shade,
And through the wood shelter,
Among crags in its flurry,
Helter-skelter—hurry-skurry.

How does the water come down at Lodore?
Here it comes sparkling,
And there it lies darkling;
Here smoking and frothing,
Its tumult and wrath in,
It hastens along, conflicting, and strong,
Now striking and raging,
As if a war waging,
Its caverns and rocks among.

Rising and leaping,
Sinking and creeping,
Swelling and flinging,
Showering and springing,
Eddying and whisking,
Spouting and frisking,
Twining and twisting,
Around and around,
Collecting, disjecting,
With endless rebound;
Smiting and fighting,
A sight to delight in;
Confounding, astounding,
Dizzying and deafening the ear with its sound.

Reeding and speeding,
And shocking and rocking,
And darting and parting,

And threading and spreading,
And whizzing and hissing,
And dripping and skipping,
And whitening and brightening,
And quivering and shivering,
And hitting and splitting,
And shining and twining,
And rattling and battling,
And shaking and quaking,
And pouring and roaring,
And waving and raving,
And tossing and crossing,
And flowing and growing,
And running and stunning,
And hurrying and skurrying
And glittering and frittering,
And gathering and feathering,
And dinning and spinning,
And foaming and roaming,
And dropping and hopping,
And working and jerking,
And heaving and cleaving,
And thundering and floundering;

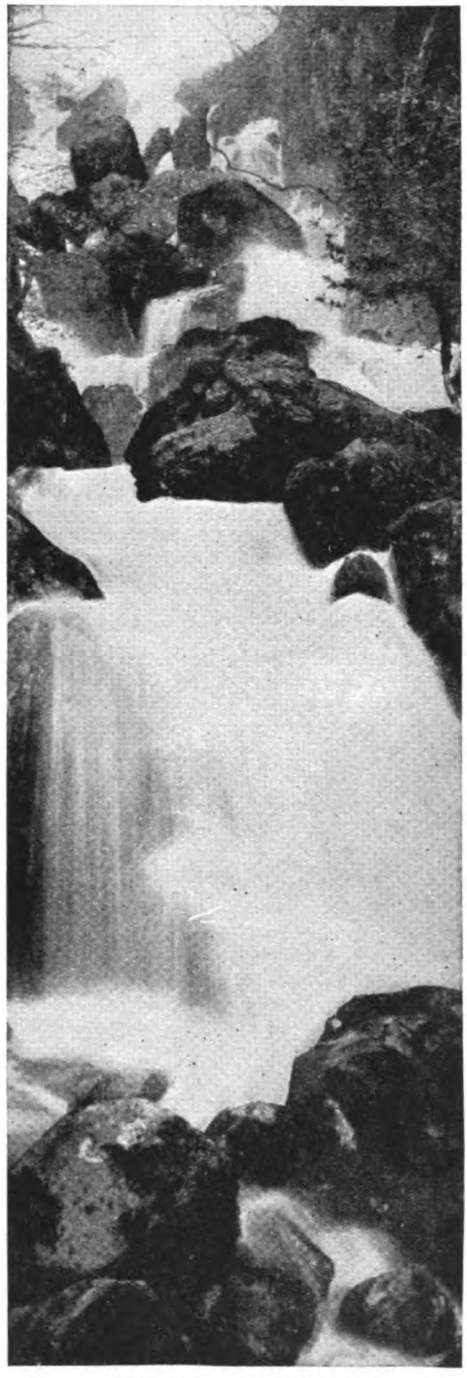
And falling and crawling and sprawling,
And driving and riving and striving,
And sprinkling and twinkling and wrinkling,
And sounding and bounding and rounding,
And bubbling and troubling and doubling,
Dividing and gliding and sliding,
And grumbling and rumbling and tumbling,
And clattering and battering and shattering;

And gleaming and steaming and streaming and beaming,
And rushing and flushing and brushing and gushing,
And flapping and rapping and clapping and slapping,
And curling and whirling and purling and twirling,
Retreating and beating and meeting and sheeting,
Delaying and straying and playing and spraying,
Advancing and prancing and glancing and dancing,
Recoiling, turmoiling and toiling and boiling,
And thumping and flumping and bumping and jumping,
And dashing and flashing and splashing and clashing—
And so never ending, but always descending,
Sounds and motions for ever and ever are blending,
All at once and all o'er, with a mighty uproar—
And this way the water comes down at Lodore.

ON MAY MORNING

These lines were written by the great poet John Milton. They are in what we call the "classic" style of poetry, stately and academic, and therefore not so "natural" as the verse of poets such as Wordsworth, Burns, and Tennyson.

Now the bright morning star, day's harbinger,
Comes dancing from the east, and leads with her
The flow'ry May, who from her green lap throws
The yellow cowslip, and the pale primrose.
Hail, bounteous May, that doth inspire
Mirth and youth and warm desire!
Woods and groves are of thy dressing,
Hill and dale doth boast thy blessing.
Thus we salute thee with our early song,
And welcome thee, and wish thee long.



"FOAMING AND ROAMING,
AND THUNDERING AND FLOUNDERING."

MARCH

What we mean by "natural" poetry is illustrated in the following verses by Wordsworth, when we compare their direct and simple pictures of natural objects with the artificial grandeur of Milton's lines "On May Morning."

THE cock is crowing,
The stream is flowing,
The small birds twitter,
The lake doth glitter,
The green field sleeps in the sun;
The oldest and youngest
Are at work with the strongest;
The cattle are grazing,
Their heads never raising,
There are forty feeding like one!

Like an army defeated
The snow hath retreated,
And now doth fare ill
On the top of the bare hill;
The Plough-boy is whooping anon, anon.
There's joy in the mountains;
There's life in the fountains;
Small clouds are sailing,
Blue sky prevailing;
The rain is over and gone!

THE FISHERMAN

Barry Cornwall in these lines is taking, perhaps, too gloomy a view of the fisherman's life; for, after all, to be "companion of the sea and silent air" is not to live entirely in vain.

A PERILOUS life, and sad as life may be,
Hath the lone fisher, on the lonely sea,
O'er the wild waters labouring far from home,
For some bleak pittance e'er compelled to roam:
Few hearts to cheer him through his dangerous life,
And none to aid him in the stormy strife:
Companion of the sea and silent air,
The lonely fisher thus must ever fare:
Without the comfort, hope—with scarce a friend,
He looks through life and only sees its end!

THE PARROT

This is a true story which Thomas Campbell, the famous Scottish poet, put into verse; and it proves what we have said so often, that in the events of ordinary life there is all the tragedy, the pathos, and the humour of the best poetry.

A PARROT, from the Spanish main,
Full young and early caged came o'er,
With bright wings, to the bleak domain
Of Mulla's shore.

To spicy groves where he had won
His plumage of resplendent hue,
His native fruits, and skies, and sun,
He bade adieu.

For these he changed the smoke of turf,
A heathery land and misty sky,
And turned on rocks and raging surf
His golden eye.

But petted in our climate cold,
He lived and chattered many a day:
Until with age, from green and gold
His wings grew grey.

At last when blind, and seeming dumb,
He scolded, laugh'd, and spoke no more
A Spanish stranger chanced to come
To Mulla's shore;

He hail'd the bird in Spanish speech,
The bird in Spanish speech replied;
Flapp'd round the cage with joyous screech,
Dropt down, and died.

THE USEFUL PLOUGH

This is a charming old English song, whose writer is unknown, but who must have known and loved the rural life.

A COUNTRY life is sweet!
In moderate cold and heat,
To walk in the air, how pleasant and fair,
In every field of wheat,
The fairest of flowers adorning the bowers,
And every meadow's brow;
So that I say, no courtier may
Compare with them who clothe in grey,
And follow the useful plough.
They rise with the morning lark,
And labour till almost dark; [sleep;
Then folding their sheep, they hasten to
While every pleasant park
Next morning is ringing with birds that are singing,
On each green, tender bough.
With what content and merriment,
Their days are spent, whose minds are bent
To follow the useful plough!

CASABIANCA

This is perhaps the best known of the many poems of Mrs. Hemans. It is the true story of the death of a boy aged about thirteen years. His father, admiral of the Orient, in the battle of the Nile, bade his young son remain at his post. The ship took fire, the admiral was killed, and all left except the noble boy, who would not leave his post without his father's permission. The flames reached the powder, and the vessel exploded, and with it perished Casabianca.

THE boy stood on the burning deck
Whence all but he had fled;
The flame that lit the battle's wreck
Shone round him o'er the dead.

Yet beautiful and bright he stood,
As born to rule the storm;
A creature of heroic blood,
A proud, though childlike form.

The flames roll'd on—he would not go
Without his father's word;
That father, faint in death below,
His voice no longer heard.

He call'd aloud, "Say, father, say,
If yet my task is done!"
He knew not that the chieftain lay
Unconscious of his son.

"Speak, father," once again he cried,
"If I may yet be gone!"
And but the booming shots replied,
And fast the flames roll'd on.

Upon his brow he felt their breath,
And in his waving hair,
And look'd from that lone post of death
In still yet brave despair.

And shouted but once more aloud,
"My father, must I stay?"
While o'er him fast, through sail and shroud,
The wreathing fires made way.

They wrapt the ship in splendour wild,
They caught the flag on high,
And stream'd above the gallant child
Like banners in the sky.

There came a burst of thunder-sound—
The boy—oh, where was he?
Ask of the winds that far around
With fragments strew'd the sea!

With mast, and helm, and pennon fair,
That well had borne their part—
But the noblest thing that perish'd there
Was that young, faithful heart!

LITTLE VERSES FOR VERY LITTLE PEOPLE

I LOVE sixpence, pretty little sixpence,
I love sixpence, better than my life;
I spent a penny of it, I gave a penny of it,
And I took fourpence home to my wife.

Oh! my little fourpence, pretty little fourpence,
I love fourpence better than my life;
I spent a penny of it, I gave a penny of it,
And I took twopence home to my wife.

Oh! my little twopence, pretty little twopence,
I love twopence better than my life;
I spent a penny of it, I gave a penny of it,
And I took nothing home to my wife.

Oh! my little nothing, pretty little nothing,
What will nothing buy for my wife?
I have nothing, I spend nothing,
I love nothing better than my wife.

PEASE-PUDDING hot,
Pease-pudding cold,
Pease-pudding in the pot,
Nine days old.
Some like it hot,
Some like it cold,
Some like it in the pot,
Nine days old.

THE fair maid, who, the First of May,
Goes to the fields at break of day,
And washes in dew from the hawthorn tree,
Will ever after handsome be.

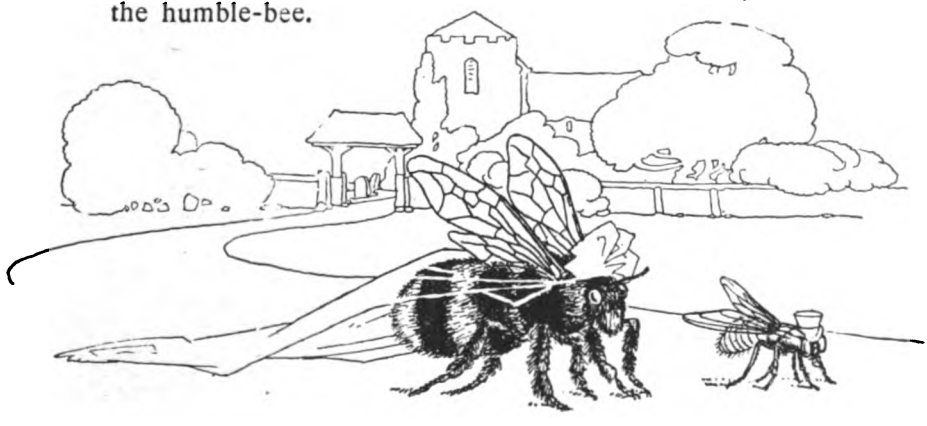
PRETTY maid,
Pretty maid,
Where have you been?
Gathering a posie
To give to the queen.

Pretty maid,
Pretty maid,
What gave she you?
She gave me a diamond
As big as my shoe.

LITTLE Miss Muffet,
She sat on a tuffet,
Eating of curds and whey;
There came a big spider
And sat down beside her,
And frightened Miss Muffet away.

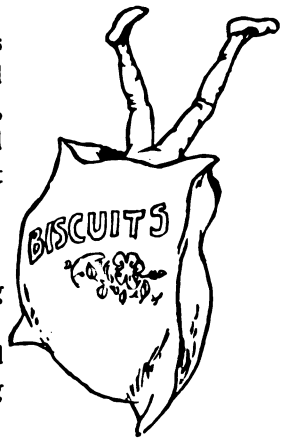
HIGGLEPY, Piggleby,
My black hen,
She lays eggs
For gentlemen;
Sometimes nine,
And sometimes ten,
Higglepy, Piggleby,
My black hen.

FIDDLE-DE-DEE, fiddle-de-dee, the fly has married the humble-bee; They went to church, and married was she; the fly has married the humble-bee.



LITTLE VERSES FOR VERY LITTLE PEOPLE

THERE was a man, and he went mad,
And he jumped into a biscuit bag,

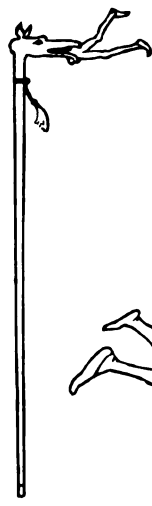


The biscuit bag it was so full,
So he jumped into a roaring bull;

The roaring bull it was so fat,
So he jumped into a gentleman's hat;

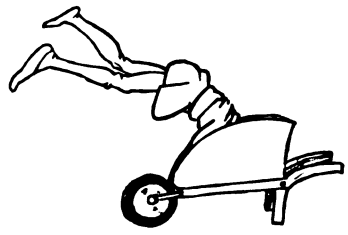
The gentleman's hat it was so fine,
So he jumped into a bottle of wine;

The bottle of wine it was so dear,
So he jumped into a barrel of beer;

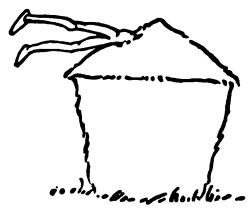


The barrel of beer it was so thick,
So he jumped into a walking-stick;

The walking-stick it was so narrow,
So he jumped into a wheelbarrow·



The wheelbarrow began to crack,
So he jumped into a haystack;



The haystack began to blaze,
So he did nothing but cough and sneeze!

JACK SPRAT could eat no fat,
His wife could eat no lean;
So it came to pass, between them both.
They licked the platter clean.

Jack ate all the lean,
Joan ate all the fat;
The bone they picked it clean,
Then gave it to the cat.

Jack Sprat was wheeling
His wife by the ditch;
The barrow turned over,
And in she did pitch.

Says Jack: "She'll be drowned,"
But Joan did reply:
"I don't think I shall,
For the ditch is quite dry."

Joan Sprat went to brewing
A barrel of ale,
She put in some hops
That it might not turn stale.

But as for the malt,
She forgot to put that;
"This is brave, sober liquor,"
Said little Jack Sprat

A LITTLE GARDEN MONTH BY MONTH

WHAT TO DO AT THE END OF JULY

CONTINUED FROM 1204

PERHAPS we have a few plants of the sweet-smelling white pinks in our garden, and have decided that we should like to have a whole edging of them either at the top or bottom of our little plot. If so it is an easy matter to increase the supply, even from a plant or two, to make a sufficient number. If we take off a shoot in order to plant it, that it may strike root, we call it a cutting, but in the case of pinks we call it a piping.

From one plant we may secure a good many pipings. The lower leaves should be removed, and either in some spare spot or in pots and boxes we may plant them, putting some silver sand with the soil, and making them quite firm.

This is the usual way of increasing pinks, but another method is oftener used in dealing with their near relations, the carnations. We do not remove the pipings, but we take these growths and "layer" them round the plant, and then, when they are rooted, sever them from the parent plant.

How to "layer" carnations

Now, if we have a few carnation plants we are sure to want to "layer" them; for one thing, because it is a most interesting bit of garden work, and, secondly, because it is advisable not to keep carnations many seasons, as the stems grow "leggy" and old-looking, and produce fewer and smaller flowers than younger plants. The process is by no means difficult, and anyone can perform it if one knows clearly what is needed.

With a sharp knife we kneel down beside the plant, and, taking a young shoot, we note a joint in the stem, and remove the leaves below this, then taking the knife we make an incision partly through the stem slantwise. The tongue portion is let into the soil, and a stick, cut to make a little peg, holds the layer in place, and about two inches of soil are carefully put over it. If the work is done at the present time the layers should be successfully rooted in about six weeks, and can be removed then or at any time during the early autumn. Carnations, as a rule, flourish and flower splendidly near the sea.

Later on we shall learn how to grow roses on their own roots, but we need not wait for the autumn if we wish to try an interesting experiment—that is to say, to strike a few cuttings in bottles of water. The climbing Crimson Rambler or the pretty little Dorothy Perkins may be used, as they root very easily. A growth that has borne a bunch of flowers may be selected, as that will probably be in the right stage to grow well—very young, soft growths should never be chosen.

We take a growth, then, that has borne flowers, and cut it under a joint, taking about eight inches as the whole length, and simply put it into a bottle of water. It may remain for some while yet, and then may be planted in a pot, or outside in the little plot. Great care must be taken in the planting, because roots that have grown in water are far more brittle than if grown in soil.

Very often where there are village and other local shows there are special classes for children. If a pot plant is shown the pot must be very clean, and soil should be quite sweet at the top—that is to say, it should not look caked or mossy. If the plant is one to need it, it should have a neat stake and be carefully tied to it, and the ends of the tying material cut off neatly. The plant should be watered the day before showing.

In the case of cut flowers it is generally advisable to cut the day before and keep in water in a cool, dark place; in sending flowers by post they travel better if cut some hours previous and placed in water, and the stalks dried on a soft cloth before packing.

In selecting vegetables for exhibition, we should aim at an even size; we should select the largest, of which we have enough to give us the number required.

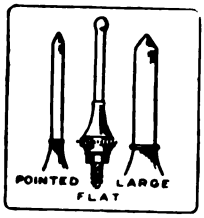
MAKING A BEAUTIFUL WAISTBAND

We are going to make a waistband out of a plain, cheap leather belt, which we shall decorate into something quite charming by the aid of poker-work. Pokering is a method of making patterns on wood by burning, so causing the surface to change from white to a deep brown in colour.

As it would be very inconvenient, and perhaps somewhat dangerous, to use a real poker, and have to be continually heating it in the fire, a little machine has been invented which does the work very simply and easily.

1. The poker-work machine

It consists of a delicate little point made of platinum fixed into a metal tube, with a cork covering for the handle. Cork, we know, is a non-conductor of heat, so that it prevents the hand from getting hurt. This point, with a handle, is attached to a bottle of benzoline by an india-rubber tube. Also connected to the bottle by another tube is a bulb, which takes the place of bellows. After the platinum point has once been heated in the flame of a candle, it can be kept red-hot as long as one wants it by pressing the bulb—i.e., blowing the bellows. This is because benzoline is a very inflammable fluid, and gives off a sort of vapour, which rises through a hole in the bottle-cork, gets up into the indiarubber tubes, and so passes along to the point where it is burnt. As it burns, it keeps the point red-hot.



2. The three kinds of points

There are three kinds of points—large, flat, and pointed—as we can see in picture 2. The large one is for deep work and rough wood, the flat one for shading and filling in, and the fine one for outlining a delicate pattern and for fine work generally.

Wood is not the only material which can be used for pokering. Leather lends itself well to this form of decoration, and, if carefully done, can be made quite charming. There is absolutely no danger in using this machine, though, of course, it is not meant for little fingers, but only for bigger boys and girls.

Before we can begin to make our belt, we must practise a little on something that does not matter if we spoil it. Get a piece of plain white wood, with a smooth surface, from a carpenter, who will sell it for a few cents. It will help you to learn how to manage the machine, and you will not be spoiling anything expensive.

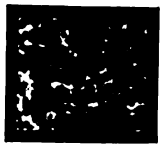
You will find out by experiment how hard to blow, because, of course, the harder you blow the hotter becomes the point. We shall find that we need a smaller amount of heat for leather than for wood. If we are using too much heat, a small flame will flicker at the end of our point as it touches the wood. This must be avoided, because it makes the surface black instead of brown, by burning it too deeply.

The chief effects are got by contrast of colour—that is, light and dark browns—and difference in the depth of the thickness of the lines.

The tones of brown which one can get vary from a pale yellowish tint to a brown which is almost black. And the lines can be merely faint marks, just indicating the vein of a leaf, or quite deep cuttings in the wood.

Then there are different ways of filling in backgrounds. In picture 3 there are two, and we shall be able to invent others for ourselves. In the first one (marked A) the flat point is used, as it is pressed along the surface of the wood in rows more or less straight, and it leaves its impression behind. The pattern thus formed is very pleasing, and suggests fine leather. The other one (marked B) is more like the grain of wood, and is done by passing the fine point rapidly over the surface, backwards and forwards, keeping it steadily at the same heat all the time, and holding it so that it lies as flat as possible—that is, on its side—upon the wood.

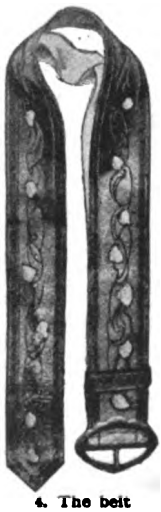
A



B

3. Two ways of filling in

We must learn to do each of these different things, and then think *in what place* to use them. For instance, let us suppose we are decorating a picture-frame. If we think, we shall see that it hangs on the wall a good way away from us. Therefore, the decoration should be bolder in design and more deeply burnt than a little box which is constantly in our hands. The most important point to remember is to think which is the most suitable way to work.



4. The belt

Before you start, always say to yourself, "Where is it going to rest when it is finished—high or low? and what is to be its use?" Someone once did a wooden tea-tray, and burnt a big pattern out all over the bottom, so deeply that there were ridges and furrows which prevented small cups and saucers from standing straight and firm, and so the tray became almost useless.

Let us be sure that our things are fit for their use, as well as beautiful. Sometimes a little colour may be

added to a pattern, but this can only be done when we have had a good deal of practice. Ordinary wood-stain or water-colour may be used, though, of course, the paint must never be put on to a pokered part.

With regard to patterns, those composed of flower-leaves and simple shapes are the best. Figures do not lend themselves well to this work, because they are so difficult to do well unless one is good at figure-drawing.

The belt in the picture is pokered in a design of small leaves, but its principal charm is that the leaves themselves are burnt right away, and fastened in behind is a strip of satin ribbon, which shows through the holes.

The kind of belt to use is a plain, light fawn leather, of the most ordinary kind, with a smooth surface and a plain buckle. It usually costs about a quarter. If you can draw only a little it will be quite enough to enable you to sketch in the leaf-shapes with lead pencil at intervals all along the strip, taking care that the design does not interfere with the buckle-holes when you come to that end. Whatever design you decide to use, do *not* omit the narrow border along each edge. When you have made the marks for the leaves, fill in the little connecting leaves.

Use the fine, thin point to pierce the leather round the outline of the leaves, going over the line several times with a fair amount of heat, and the piece will drop out. Then carefully darken the edges with the point, and smooth away any little bits which destroy the leaf-shape of the hole.

The border at the edge is the darkest part. Make that fairly solid with one of the "filling in" patterns given in picture 3. The space between the border and the lines which connect the leaves is dotted with the sharp point. Hold the poker in an upright position for these, and press gently, taking care to make the dots of equal depth.

A small spot of sealing-wax at each end, and one in the middle, will keep the ribbon in place and prevent it from riding up when worn. Use a ribbon slightly narrower than the belt. The complete machine can be ordered from any of our big stores, and costs from one to three dollars.

HOW DID THE LADIES CUT THE CARPET?

THREE Japanese ladies possessed a square ancestral carpet of considerable value, treasured as an interesting heirloom in the family. They decided to cut it up and make three square rugs of it, so that each should possess a share in her own house.

One lady suggested that the simplest way would be for her to take a smaller share than the other two, because then the carpet need not be cut into more than four pieces.

There are three easy ways of doing this, which we will leave you the amusement of finding for yourself, merely saying that if you suppose the carpet to be nine feet square, then one lady may take a piece six feet square whole, another a six-feet square in two pieces, and the third a three-feet square whole. But this generous offer would not for a moment be entertained by the other two sisters, who insisted that the square carpet should be so cut that each should get a square mat of exactly the same size.

How did the Japanese ladies cut this carpet?

Now, according to some wise people, the Japanese ladies would have found it necessary to cut the carpet into seven pieces in order to get the mats the same size, but Mr. Dudeney tells us, in "The Canterbury Puzzles," that a correspondent in Tokio has assured him that they did it in six pieces only. Can you cut out the six pieces that will form three square mats of equal size? The way in which the Japanese ladies did this is explained in that part of our book beginning on page 1348.

HOW TO HIDE IN THE OPEN COUNTRY

IN these days of scouting and camp holidays it is useful to know how to keep ourselves from being seen when out in the open country; so that if we are doing any serious scouting, or are playing any of the well-known scout games, we may hide from those we are watching or following.

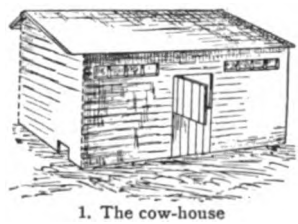
The first point to remember is that we should always keep low down — lying on the ground when still, and crawling when we move. To appear above the skyline on rising ground is fatal to concealment.

A little thought and examination of our surroundings will enable us to select the best background for concealing ourselves. If we have to move across a tract of country that is probably being watched, it is wise to make ourselves look as much like the surroundings as possible. We remember that when the Scottish Prince Malcolm marched with an army against Macbeth, who was shut up in the Castle of Dunsinane, the attacking army came from Birnam Wood, and in order that their advance might not be noticed, each soldier carried a bough from a tree. Savage hunters often dress in the skin of some wild beast in order that they may pass unnoticed.

CONTINUING MODELTOWN FARM

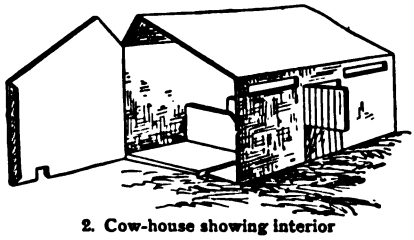
We have made the farmhouse and the dairy, and can now devote our attention to the outbuildings. The first of these will be the cow-house, which is shown in pictures 1 and 2, the latter representing it open.

The interior of the cow-house will be carefully fitted with a special floor, and with stalls for the animals. The end shown open will not be glued to the walls, so that it may be opened at any time so as to allow the interior to be inspected. Picture 3 gives the plan of the cow-house, and is made half-scale, so that in making our drawing we use scale-rule B to take the measurements, and our full-sized rule to make our lines on the card. Having made and cut out the plan we fold it up, and picture 4 is a view of it as it is being folded up. Picture 5 is a plan of the inside floor, which must be made and fitted inside the floor in the main plan. It may be made out of thin card or thick notepaper. The drawing is half-scale, so we use scale-rule B for taking the measurements. Two of the dotted lines in the plan have small circles at their ends. These lines are to be half cut through, not on the side of the drawing, but on the back of the card. If we use notepaper instead of card, we need not cut them half through at all; it will do if we bend them from the opposite side of the paper.



1. The cow-house

Picture 6 indicates the way in which the false floor should be folded and fitted. The long gutter is for purposes of drainage, and every well-appointed cow-house has a gutter for drainage. Picture 2 also shows one end of the gutter. We may make three stall partitions if we wish to complete the cow-house inside. We can easily take the sizes for ourselves, hence no plan of them is shown. They should be glued on at the chain lines shown on the plan of the floor given in picture 5. The stall partition nearest to the hinged wall may be seen in picture 2.



2. Cow-house showing interior

Let us take the calf-shed next. Picture 8 gives the plan, which is half-scale, so that we take the measurements with scale-rule B. When cut out and being folded up the calf-house will be like picture 7, and when completed and glued it will be like picture 9. It is very easy indeed to make. The back of it can be left open. There is no window in the calf-house, as young calves are usually kept in a gloomy or dark place, which must, however, be warm. They are allowed to lie on straw, and no special inside fitting is necessary.

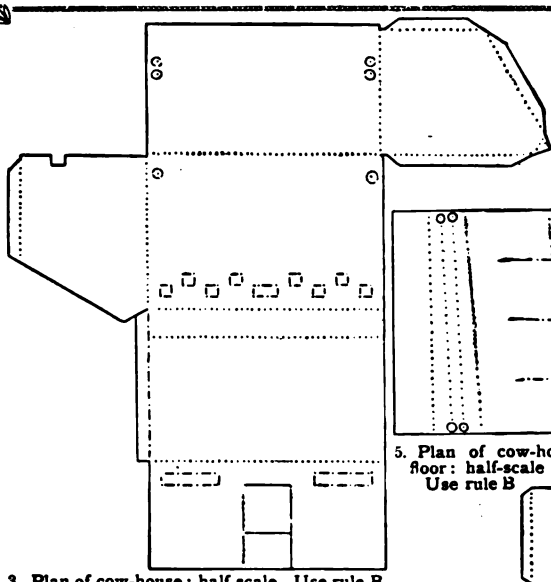
On a farm the horses are as important as the cows, and a stable must be provided. Picture 10 is a view of the stable, and picture 11 is the plan half-scale. As the inside of the stable will be seen, we can make the windows on both sides of the card. Again we use scale-rule B, and, after making and cutting out the plan, fold it up, when it will assume the position shown in picture 12. At the crosses marked in the plan, pinholes should be made, and these will show where the stall divisions inside may be put. The stable roof can be left unglued at the front, so that it may be raised to allow the inside to be seen, as shown in picture 13. The door hinges open in two portions, as nearly all stable doors do. Two stall partitions are necessary, and the plan is given full size in picture 14. The pinholes indicate where they must be glued into position. The stable will hold three horses, which would be enough for a small farm; but if we decide to keep more horses we can make another stable, or even several others, the same as that we have already made.

Our farm will have a good many pigs, so we shall make four pigsties in one row, as seen in picture 15. Picture 16 is the plan, and is half-scale. Pinholes must be made at the crosses to show where the partitions go. After being made by using scale-rule B to take the measurements, the sties fold up as shown in picture 17. But before gluing the roof to the walls, the partitions must be fitted. The plan of a partition is given full size in picture 18. This must be made three times, and the inside partitions placed where the pinholes were made. Picture 19 also shows where the partitions go.

Now, after putting a touch of glue on the top and front edges of the partitions just fixed, the long front wall of the enclosed compartments may be folded over and glued down. The front wall of the open space should now be bent up and glued to the two side walls.

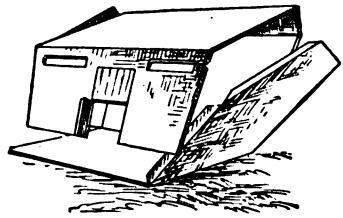
There remain the partitions in the open space to be made and fixed. Each partition may be made with a trough, the two being made in one piece. Picture 20 is a plan of a partition and trough; it is full size in the picture. We make it three times, and glue the three pieces into place as drawn in picture 19. The pigsty is now quite complete.

We have given attention to the cows, horses, and pigs; it is proper now to attend to the hens and chickens, without which no farmyard would be complete. Picture 25 shows our hen-house. It is raised above the ground so as to keep the chickens dry. The plan of the hen-house is given full size in picture 21, and we therefore make it the same as shown. Two pinholes made where there are crosses in the picture will show where to put the perches inside. The roof of the hen-house is given in full-sized plan in picture 22,

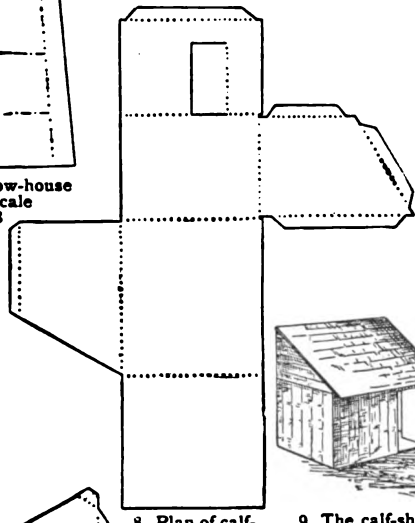


3. Plan of cow-house : half-scale. Use rule B

5. Plan of cow-house floor : half-scale Use rule B

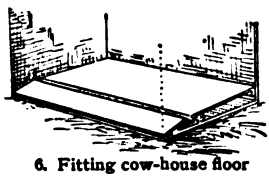


4. Folding up the cow-house

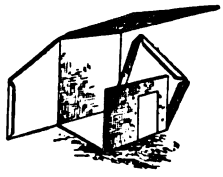


8. Plan of calf-shed : half-scale Use rule B

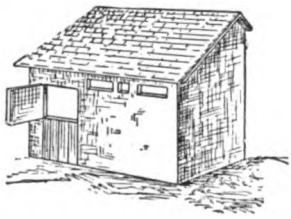
9. The calf-shed completed



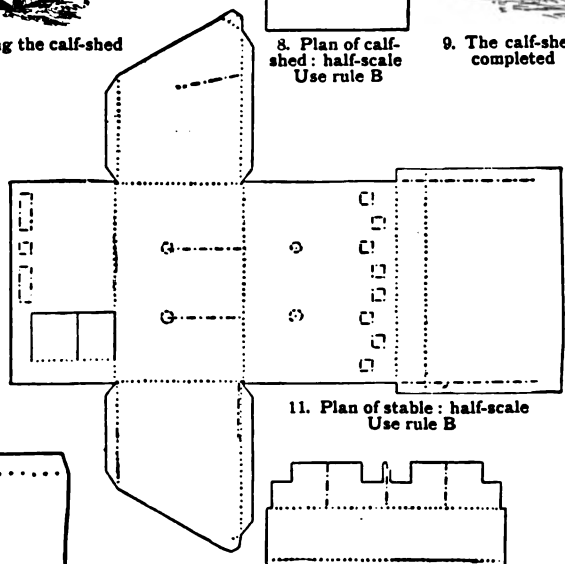
6. Fitting cow-house floor



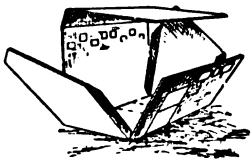
7. Folding the calf-shed



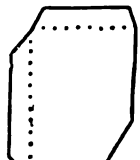
10. Stable



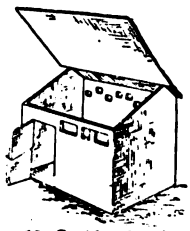
11. Plan of stable : half-scale Use rule B



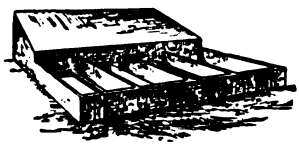
12. Folding the stable



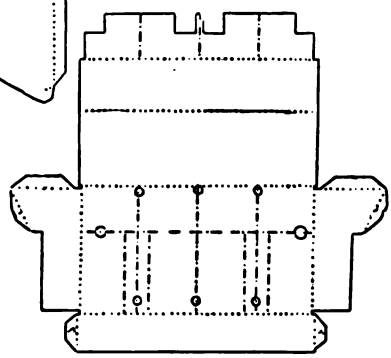
14. Plan of stable partition : actual size



13. Stable showing interior



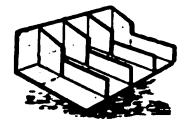
15. The piggery



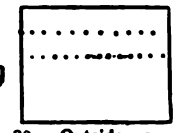
16. Plan of pigsties : half-scale. Use rule B

17. Folding the pigsties

18. Pigsty partition actual size



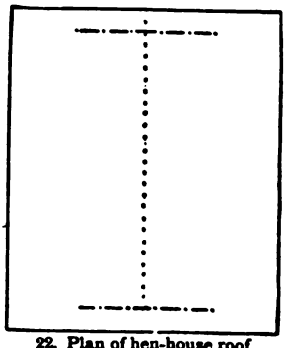
19. Partitions for pigsty



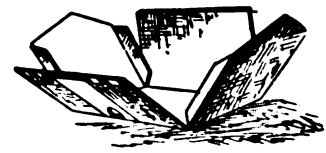
20. Outside partitions for pigsties actual size

21. Plan of hen-house: actual size

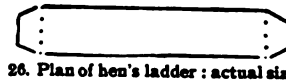
23. Strut for hen-house roof actual size



22. Plan of hen-house roof actual size

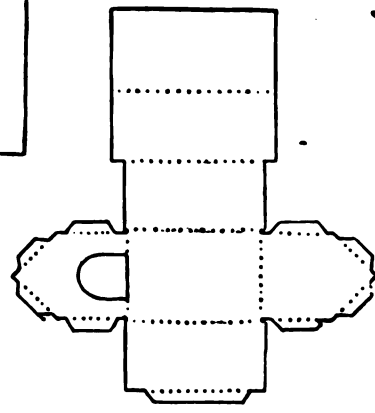


24. Hen-house being folded up

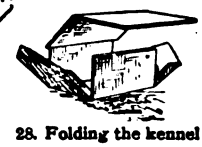


26. Plan of hen's ladder: actual size

25. Hen-house



27. Plan of kennel: actual size



28. Folding the kennel

29. Kennel complete

and the strut of the roof, which we must make twice, in picture 23. The struts are glued inside the roof along the lines marked in the plan of the roof. The hen-house as it is being folded up and the roof above it are shown in picture 24, and the completed hen-house is in picture 25. Two splinters of wood, such as large wooden matches with the heads cut off, may be glued to the bottom of the hen-house underneath, and will keep the structure off the ground. Two splinters of wood cut to the proper size may also be put inside the house where the pinholes were made. They will do duty as perches for the fowls. They may be glued into place, or pins may be pushed through the walls of the house through each end of each perch to support them. We shall provide a ladder to the higher perch, and its plan is given full size in picture 26. One end is glued to the floor, and the other end to the perch. The roof of the hen-house will be left to lift off.

Modeltown Farm will have two dogs, and therefore two kennels. We have already made a kennel when we built our villa, so we know how to do it well. Picture 27 is the plan of a farm kennel, and is full size. We make two drawings of picture 27, cut them out, fold them up as shown in picture 28, and then glue them into shape as seen in picture 29. That completes the second part of Modeltown Farm.

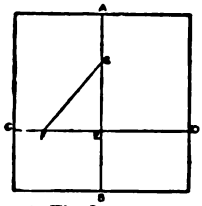
We have yet to make a barn and a cart-shed, to place all our farm buildings in convenient positions for the working of the farm, to put walls and gates around so that the farmyard may be properly enclosed, and finally to make a hayrick and a corn-stack in the field just outside the farm gate.

All these things we will do in our next building lesson, in which we shall also be able to see what our farm is like after it has been completed and photographed.

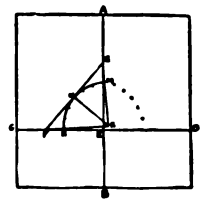
HOW TO MAKE A SUN-DIAL

Most of us know that a sun-dial is an instrument that enables us to tell what o'clock it is, not by looking at a watch or a clock, but by seeing the shadow cast by the sun.

Sun-dials are not much used now, because they can tell the time only when the sun is shining, and clocks and watches are now everywhere available as they were not when sun-dials were first manufactured. But we see how to make a sun-dial.



1. The first stage of the sun-dial



2. The second stage of the sun-dial

It would be easy for us to make a sun-dial by having a drawing, which we could copy. But we must do more than merely copy a drawing; we must see how the lines upon the sun-dial are arrived at. A sun-dial that is to lie in a horizontal position is different from a vertical sun-dial facing south, and both of these are different from a vertical sun-dial facing west or north or east. Here we will see only how to make a horizontal sun-dial, which, though not precisely accurate, will enable us to come near the hour.

First we take a piece of card—say, not smaller than six inches square, but preferably a little longer, say, nine inches square. We first make a line right down the middle from the centre of the top to the centre of the bottom. This line we shall call A-B, and we have marked it so in picture 1, A being at the top. We now draw another line right across the card from one side to the other, about one-third of the distance from the bottom of the card, as we see in picture 1.

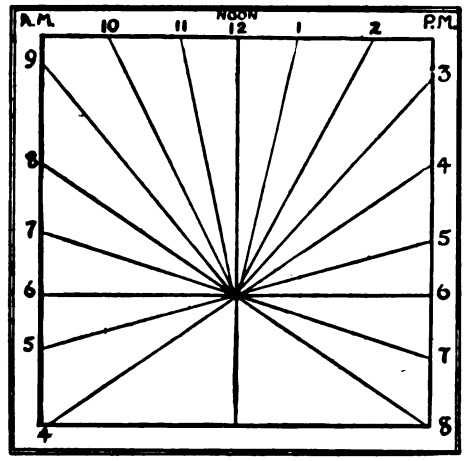
This line we will call C-D, the left-hand end being C and the right-hand end D. The point where these lines cross we shall call E. Now we take a point on the line E-C, about one-third of the length of the line from the edge of the card, and we call this point F.

The next part of our work depends upon where we live. If we look at any map we find lines of latitude, and places with different lines of latitude require different sun-dials.

If we look at Chicago on the map we find that it is in latitude 42, Liverpool is in latitude 53½, Edinburgh is in latitude 56, and Aberdeen is about latitude 57. The angle that we make at the point F depends upon the line of latitude of the place where we live.

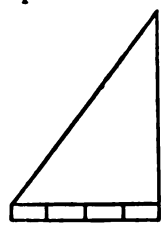
But in our description here we shall make the sun-dial for the latitude of Chicago. Those who live in places with a different latitude from Chicago must look at a map and see in what latitude they live and then make the next part accordingly.

Chicago, as we have seen, is in latitude 42, so at the point F we draw a line that will make with the line C-E an angle of 42, and draw this new line right up till it touches the line from A to B. The point where the line from F touches the line A-B we shall call G. Our drawing is now like picture 1, but much larger. We have seen on page 445 how to make angles of different degrees, and if we have followed the instructions given there we shall not have much difficulty about it. The next thing is to bisect the line F-G, and the point where it is bisected we call H.



3. The marking of the sun-dial

To bisect a line, of course, is to cut it into two equal parts. Now we make a line at right angles to F-G, and make it the same length as H-G or F-H, which are of equal length. The end of the new line we shall call K. Draw a line from the point K to the point G and another line from the point K to the point F. Then we draw a circle or a part of a circle with K as centre and with the radius H-K. This part of a circle, or *quadrant*, as it is properly called, will cut the line K-G at a point we shall call M, and the line K-F at a point we shall call N.

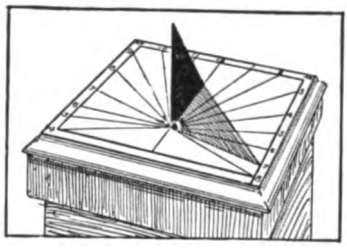

4. The gnomon or upright part

Now we divide the quadrant into six equal parts, and this will give us the five points seen on the quadrant in picture 2.

We now wish to find five points on the right-hand side of the line B-A to correspond with the five points which we have found on the quadrant we have made. We could find these other five points by working out another quadrant on the right-hand side of the line A-B, but an easier way is to put a piece of tracing-paper on the drawing, mark on it the line A-B, the line C-D, and the five points of the quadrant. Then, if we turn the tracing-paper face

downwards, with the lines A-B and C-D on the tracing paper right on top of the lines A-B and C-D on the drawing, we can make the five points in the right places. Picture 2 shows the work as it appears at this stage.

Now we draw straight lines from the point E through all the points we have found right to the edge of the card. The drawing will begin to look like picture 3, which shows our dial with the quadrant and the triangle deleted, as these are not necessary after we have made the lines left in picture 3. It will be seen that picture 3 has at each side of A-B two lines below C-D. These are made by extending the lines from the other side of the drawing. Having made all these lines, we may put figures round the dial and two outside lines, as seen in picture 3. We have completed the dial proper—that is, the surface upon which the sun is to cast its shadow—but we have yet to make the gnomon, as the part is called that casts the shadow. We pronounce this word as if it had no "g."



5. The completed sun-dial

To make the gnomon we cut out a triangle having an angle of 42 degrees. Such a triangle is shown in picture 4. The base of the triangle may be half the size of the line A-B on the dial, but the size is not so important as the angle is. We can leave at the base of the triangle a piece to fold over on the dial and be gummed or glued to the dial. A folding piece has been left in picture 4. The back of the gnomon—that is, the upright edge—is set to face the north where we have "12 noon" marked on the dial. The gnomon, having been cut out, is placed quite vertically on the dial and right along the line A-B, as seen in picture 5. It should be glued or gummed to the face. Then, when we place the dial in the sun, with the line from the bottom to 12 noon pointing due north at the 12 noon end, we may tell the time.

A GOOD GAME TO PLAY WITH DOMINOES

THE game of All Fives, or, as it is often called, Muggins, is one of the best games to play with dominoes, and not only is it very exciting and amusing, but it provides splendid practice in counting quickly. Success at the game does not depend so much upon the dominoes we have as upon the way we play them.

All Fives is a game for two, three, or four players. The dominoes are shuffled face downwards, and each player takes an equal number, say, five or six, and there must always be left at least two that are not turned up all through the game. When it is decided who shall begin the game, the player selected puts down a domino, then the next player has to match one end of this, and, after he has put down his domino against the other, the third player has to match one of the ends, and so on. The idea of each player is to make as many fives as possible. All double dominoes have to be put crosswise, and both halves are counted in reckoning the number of spots. If a player cannot match either end of the row of dominoes from his own supply, he must draw from those left upside down until he *can* go. In drawing, however, it must be remembered that two dominoes are always to be left unturned and unused. This is to prevent any player drawing the whole stock, and thus knowing what dominoes are in the hands of his opponents, or, in other words what dominoes he has to reckon with.

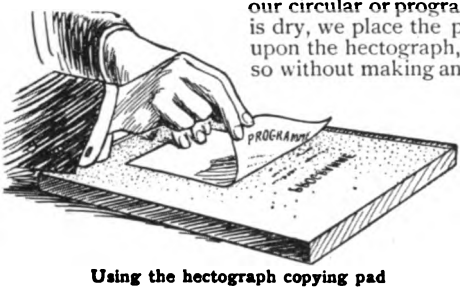
When a player puts down a domino, and the spots at the ends, added together, make five, he scores one point. If they make ten, he scores two, and so on. The highest number of spots possible at the ends is twenty — the double six at one end and the double four at the other; and this combination, of course, scores four points. Any number of points may be decided upon beforehand to decide the game, but the usual number is 31.

We will suppose that the first player had no card the spots on which would add up to five or a multiple of five, so he puts down the 4—3. The next player plays the 3—1, and the outside spots — that is, the four on one side and the one on the other — make five, counting one point. Now, the next player, finding he cannot score, puts down the 1—2, and makes no point. Then a player puts down at the left-hand end the double four, and this, with the two at the other end, makes ten, and he scores two points. The next player cannot score, so puts down the 2—6. The next player at once places the double six at the right-hand end, and the twelve here, with the eight at the other end, makes twenty, and he scores four points. The next player puts down the 4—5, and he fails to score; but the next one, by placing the 5—3 at the left, makes fifteen spots and scores three. And so the game proceeds, until one player has used up all his dominoes. The players take it in turn to be first to put down a domino at each round of a game. Of course, after each round all the twenty-eight dominoes of the set are shuffled, so that the same two are not left unturned each time. It is astonishing what a help this game is in teaching us to add, multiply, and divide.

A SIMPLE COPYING APPARATUS

THERE are many occasions when even a schoolboy would find advantage in having an apparatus that would enable him, after writing something out once, to take many copies of it without the labour of rewriting it. Therefore, in this article we shall see how to make what is called a *hecto-graph*—that is, a simply-made pad which gives the ability described above.

The first thing we require is a very shallow tin dish, which must be larger than any piece of paper we are likely to use for any circulars or programmes we are likely to make. The lid of a square or oblong bread box will do nicely. Then we require some material, which will not cost more than a few pennies. We must have 1 ounce of gelatine, 1 ounce of brown Demerara sugar, 6 ounces of glycerine, and 2½ ounces of barium sulphate, which we can purchase from a druggist. We had better also have a 1-ounce bottle, which we can buy at a drug store. We break up the gelatine into small pieces, and put it in a small saucepan with 3 ounces of water, letting it steep there overnight. The bottle, filled three times, will give us 3 ounces of water. Next morning we pour in the glycerine, and heat the whole lot over a gentle fire. Now we put in the sugar, and keep the mixture hot until the sugar also is dissolved. We take the barium sulphate and mix it up thoroughly with 1 ounce of water in a cup, and then pour this into the saucepan beside the other things we have already put there.



Using the hectograph copying pad

When we have mixed this thoroughly by stirring it, we pour it into the flat tin dish with which we provided ourselves. The dish should be quite clean and free from grease. If necessary, we can wash it with hot water and soap before we begin. When the mixture has hardened it will have a flat surface like soft indiarubber. It is then ready for use.

We can purchase hectograph ink at any stationer's, or we can make it ourselves. If we prefer to do the latter, we take our 1-oz. bottle to the druggist, and ask him for 2 drachms of methyl-violet aniline and 2 drachms of spirit. Fill up the bottle with water, and shake it until the aniline is dissolved.

The method of using our hectograph is simple. We take a piece of paper with a highly-glazed surface, and write with our ink our circular or programme. When the writing is dry, we place the paper, face downwards, upon the hectograph, taking care that we do so without making any wrinkles in the paper. Now we rub the back of the paper with the fingers so as to press the writing upon the surface of the composition. After the paper has remained five or ten minutes, we remove it, pulling it off by one end. The hectograph will be found to have taken the impression of the writing. We now take some sheets of paper not so highly glazed as the paper upon which we wrote, and press them, one after another, upon the hectograph surface, letting them lie for a few seconds before removing them. It will be found that an impression of the writing has come upon the paper, and that we can take forty or fifty copies of the circular before the ink becomes too faint to be legible.

To clean the hectograph we wash it first with a little water mixed with an eighth part of hydrochloric acid, also known as spirit of salt, and then with pure water. It should stand for at least twelve hours after it has been cleaned before it ought to be used again.

HOW TO MAKE INVISIBLE INKS

DURING the first Afghan War, an officer in India received a paper on which was written only the word "Iodine." He put some tincture of iodine over the surface of the paper, and immediately an important message appeared upon it. The words of the concealed message had been written in rice-water, which made no visible marks; but when the paper came into contact with iodine the lettering stood out plain.

A method of secret writing which has been used by the friends of prisoners who write to them is ingenious and simple. A prisoner's friend may address to his unfortunate comrade a letter of a simple, ordinary nature, which is sure to pass the eye of the governor. The prisoner receives the letter in due course, and rubs a dirty finger between the lines of the visible writing, and new lines appear. The secret is simple. His friend has written between the lines a second letter in milk, and the passing of the dirty finger over the milk lines makes them visible. Sometimes one may want to write a letter that would be visible to the recipient, but would become invisible in a short time. An ink for this purpose may be made by taking 10 grains of arrowroot and boiling it in 1 gill of water, and then, when cold, adding 25 drops of tincture of iodine. The writing made with this ink is visible when written, but it becomes fainter and disappears in about four days.

Some inks, invisible when used, become visible by heating. If 1 drachm of chloride of cobalt and 1 drachm of gum arabic be dissolved in 1 ounce of water, the result is an ink which is invisible, but which becomes blue as the paper is heated, and again disappears when the paper becomes cold. It may be made to appear and disappear again as often as the paper is heated and allowed to cool. A green ink with the same properties is made by dissolving 10 grains of chloride of nickel and 10 grains of chloride of cobalt in 1 ounce of water.

A LITTLE BOX THAT MAKES A WHIRLWIND

We all know what a whirlwind is. Owing to differences in temperature, the air is set in motion in a spiral fashion, and sometimes the great whirling column of air rises to a thousand feet in height, and does an immense amount of destruction to property in the neighbourhood where it is.

It is to be hoped that none of us may ever be at any place where a really bad whirlwind is formed; but we may each of us make a miniature whirlwind in a very simple way. We take a box with a lid that swings backwards and forwards quite easily upon its hinges — a box such as the ordinary kind of cigar-box that holds a hundred cigars — and knock out the bottom of it. Then we stand it up on its end, and swing the door violently. The door pushes the air in front of it, and when it is closed there is for a moment no air left in its track. But instantly air rushes in from all directions to fill up the vacant place, and the result is a miniature whirlwind. That the air is whirling round may be seen by putting down in front of the box some tiny fragments of tissue-paper, which are carried round and round by the cyclone. Of course, the larger the box the greater will be the whirlwind. A soap-box, that may be obtained from almost any grocer, is a very good size to use for this experiment.

THE ANSWERS TO THE PROBLEMS ON PAGE 1080

56. Yes, Joan had enough money. If they had $45 between them, and Joan had $10.50 more than Janet, Joan must have had $5.25 more than half of $45, and Janet $5.25 less than half. Thus Joan had $27.75, and Janet had $17.25.

57 The engine goes forward along the main line, backs up the left side of the branch line and pushes car B through the bridge. Then the engine comes down the branch line to the main line, along the main line to the right of the picture, then up the right side of the branch line, and pushes car D up to car B. At this stage the position is like this:

Then the engine pulls down both cars, brings them both to the middle portion of main line, where it leaves car B (which is the one furthest in front of it), and, going back again with car D, pushes it up the right side of the branch through the bridge. The position is then like this:

Now the locomotive comes back again to the main line, takes car B, and leaves it at the post C, finally coming down again along the main line, up the left side of the branch line and pulls car D into its place. It can then return to the main line alone.

58. There were four in the party. The father and mother were brother and sister, one having a son and the other a daughter. The children were cousins, therefore nephew and niece, and the father and mother were thus uncle and aunt.

59. Evans does one day's work more than half the field, and Watson would take two days to do this piece, so that Evans does as much in one day as Watson does in two days. Thus, if they work together, Evans will mow two-thirds of the field, and Watson one-third. Thus Evans mows one-sixth more than half the field, and does this in one day; so that Watson mows one-twelfth of the field in one day. Together they will do one-sixth added to one-twelfth, which is one-quarter, and will take four days for the whole field.

60. At present Hugo has $1.25 more and Harry has $1.25 less than half the whole money. If Hugo wins, he will have three-quarters of the whole money, so that $1.25 is half the difference between half and three-quarters of the whole money. This means that $2.50 is the whole difference, so that they must have $10 between them. Hugo will have three-quarters of this $10 (that is, $7.50) if he wins, so that he must have $6.25 now, and Harry has the remaining $3.75.

61. John and his father together earn 25 cents per day more than Henry and his father, so that John earns 25 cents more than Henry. As the two sons together earn $1.75, John must earn $1 and Henry 75 cents. Thus the father earns $1.50 per day.

62. Divide $47.50 by $2.50 and the result is 19. Nineteen times $2.50 were charged for 12 visits. We have to find two numbers which, when added, make 19, and when one is added to half of the other make 12. The easiest way is to try several numbers. The number that we divide must be an even number. 18 and 1 make 19; but 9 (half of 18) and 1 make only 10. 16 and 3 make 19, but 8 (half of 16) and 3 make 11. 14 and 5 make 19, and 7 (half of 14) and 5 make 12. So 14 times $2.50, or $35, were charged for seven night visits, and 5 times $2.50 (or $12.50) for five day visits — that is, $47.50 altogether.

63. If 225 men took 7 months to make 21 miles of railway, they would take 9 2-3 months to make the remaining 29 miles. If 225 men would take 9 2-3 months to do something, the same work could be done in 5 months by 435 men. He therefore engages an extra 210 men.

THE NEXT THINGS TO MAKE AND TO DO BEGIN ON PAGE 1345.

WHAT THIS STORY TELLS US

THE world is made of about eighty kinds of matter which we call elements. We must be quite clear in our minds about what an element is. An element is something which is all made of one kind of atoms. Hydrogen and oxygen are elements, but water, which is formed by hydrogen and oxygen, is not an element, because it is made by hydrogen and oxygen and can be broken up into them. No chemist can break up an element into anything else; though we are just learning now that even the atoms of the elements may be changed by forces within themselves. So that the elements are the very foundations of the world, the things from which all other things are made. And, though there are about eighty of these elements, there are two chief things we must remember about them: a few of the elements are much more important than all the others put together, and the whole of the elements are related to one another. Here we read about some of the chief elements; where they are found, what they do, and how they help each other in the work of the world.

THE MOST IMPORTANT ELEMENTS

CONTINUED FROM 1196

WE all know coal; we have all seen diamonds and charcoal; and we have all used what is stupidly called a lead pencil. A wonderful and most important element it is that makes all these very different things. It is nothing like as abundant in the world as any of the three gases we have talked about, but it is no less important, because it gives rise to a countless number of compounds. It is also, like each of those three gases, a necessary part of all living creatures.

This element is called carbon, from the Latin word for charcoal, which is carbo. Nothing could be more different, to look at, than any of those gaseous elements we have talked about. We know carbon in many forms, but usually think of it as a black powder, like charcoal. Sometimes, however, it occurs as a heap of tiny crystals, and that is what makes the "lead" of lead pencils. The name is very stupid, because lead is another element, and has nothing to do with lead pencils. Carbon also occurs as larger crystals of a different shape, called diamonds.

These are rare, hard, and bright, and therefore valuable; but they are not worth the life and money which are spent in digging them out of the earth, and therefore we must hope that the chemists will soon learn how to make diamonds, so that all this life and money may be saved, and so that everybody may have as many as they please. Beautiful things cannot be too common. Already chemists can make very, very tiny diamonds.

If you make a diamond very hot, in the absence of air it swells up and makes a black stuff, which is charcoal. If air is present, it burns and makes common carbonic acid gas. At ordinary temperatures carbon, then, unlike these other elements we have been talking about, is not a gas, but a solid. It is, so to say, frozen. When it is made intensely hot, we find evidence that it becomes a gas. It seems, as it were, to jump the liquid stage, so that no one has ever seen liquid carbon. It is twelve times as heavy as hydrogen. We usually represent it in chemistry by a capital C; so that you now know what the capitals H, O, N, C mean. Water is made of H and O, ammonia of N and H, and a gas called marsh-gas or firedamp, much feared by miners, is made of C and H.

It was a great Frenchman, Lavoisier, who showed that diamonds were made of carbon. He belonged to the class of people against whom the nation rose during the French Revolution, and they cut off his head, saying "The Republic has no need of chemists." The Republic knows better now, and honours its great thinkers and men of science.

One of the interesting ways in which we find carbon is from charcoal. It is

usually made from wood by charring it, and in some parts of the world wood charcoal is used as fuel. It goes into gunpowder also, and at one time was much used for getting rid of bad smells, since it has a wonderful power of storing up gases in itself.

But, in whatever form we find carbon, we can never think of it as a metal, though it is solid, and may often be very hard. Though the diamond is vastly different from charcoal, yet neither the one nor the other, nor any other form of carbon, is in the least like gold or silver or lead, or many other solid elements which we call metals. We may learn, then, that the solid elements may be divided into groups, as, indeed, all the elements may, and we shall think of carbon as the best representative of the solid elements which are *not* metals. There is no need for us here to mention all the various elements. Most of them are quite unimportant except to the chemist. But we must have some idea of the different kinds of substance which we find among the elements—for instance, a gas like oxygen, a solid like carbon, and a solid of such a very different kind as gold. There are also a very few liquid elements, of which the most remarkable is mercury.

SOME OF THE CHIEF SOLID ELEMENTS THAT ARE NOT METALS

Among the solid elements that are not metals, we must mention one or two on account of their importance.

Perhaps, after carbon, sulphur is the most important of these non-metallic elements. Like carbon, it is a solid, by which we mean that it is a solid at ordinary temperatures. Of course, we believe that any element might possibly exist either as a solid or as a liquid or as a gas, according to the conditions it is put into. We must not forget this, for we are apt to say that such and such a thing is a gas or a liquid or a solid, though all we mean is that it is most commonly met with in that state. Sulphur, then, though it is a solid, can easily be made liquid, and can also be quite easily made into a gas. This element is yellow. You have very likely seen it as a yellow powder. Like carbon, it has none of the appearance of a metal; and, also like carbon, it does not melt in water. Yet, again, we find it in many different forms, just as we saw with carbon. The difference between the "lead" of pencil and the diamond is that the carbon forms crystals of different shapes in the two cases. In the same way sulphur forms different crystals in different cases, and looks different accordingly. This element has a special importance because it is very commonly, if not always, found in living matter. It is used by doctors, by makers of matches, and for other purposes. Most of it is obtained from places like Sicily, where quantities of it are found either on the surface or not far from the surface.

TWO ATOMS OF OXYGEN AND ONE ATOM OF SULPHUR MAKE A MOLECULE OF GAS

Both carbon and sulphur can be oxidised, or combined with oxygen, and in each case the result is a gas. In order to make this gas, which is, of course, a compound, two atoms of oxygen unite with one of carbon to make a molecule of the gas, and the same is true in the case of sulphur. Now, since S stands for sulphur in chemistry, we can easily represent the two gases which are made by the oxidation, or burning, of carbon and sulphur; the one will be CO_2, and the other SO_2.

These oxides, as they are called, are very much the most important compounds into which carbon and sulphur enter. The first of them is called carbonic acid gas, which, as we know, is present in the atmosphere, and is a product of breathing, while it is part of the food of green plants. The corresponding oxide of sulphur is not so important as carbonic acid, but it is important, for it goes to make various salts that are found in the soil and in the sea, and are used by vegetable life.

HOW DIFFERENT ELEMENTS ARE MADE IN THE SAME WAY OF THE SAME STUFF

Before we go on to the metals or the metallic elements, there is a little group of elements that we must mention, since they stand quite in a class by themselves. You may know the names of two of them, at any rate. They are called *fluorine*, *chlorine*, *bromine*, and *iodine*. The first two are gases, the third a liquid, and the fourth a solid, but not a metal. Bromine and iodine are got from the ashes of seaweed, which gets them from sea water. The interesting thing about these four elements is that,

though they are very different from each other in many ways, yet no one can study them without seeing that they must be relations of each other, and so they are. They are almost the best instance we know that teaches us how the elements can be sorted out into groups, and the lesson which these four elements teach us has, in the last few years, been seen to be one of the most important lessons in the world. It is that, though we talk about oxygen and iodine and gold as elements, yet they are not utterly different from each other; and if we could only see them close enough, we should find that, at bottom, not merely are they related to each other in groups, but they are all made on the same principles, and of one and the same stuff.

We shall come back to this great discovery afterwards. Meanwhile, we must remember that, though we speak of elements, yet these elements are related to each other in groups, and that their relation means something.

THE ELEMENTS THAT MAKE UP A COUNTLESS NUMBER OF SALTS

The four elements we have just named, which are so strikingly related to each other, are called *halogens*, which really means salt-makers. They all form compounds very like common salt, and they can turn each other out of their compounds in a regular order and very strikingly. The number of salts that these salt-making elements can form is almost numberless. The standard and type of them all, however, is the commonest and most important salt in the world, which we all know very well, and which most of us just call salt.

Like all salts, common salt is a compound. Its molecule—the smallest part of a compound that can exist—is really a very simple one, for it merely consists of one atom of the salt-maker chlorine, and one atom of a metal called sodium. In chemistry, we represent sodium by Na, which are the first two letters of its Latin name; and chlorine we represent by Cl; we cannot use C by itself, for that has been already taken by carbon. Common salt, then, is called by chemists sodium chloride, and it is represented like this, NaCl, which tells us its composition, the most important thing about it. It is the commonest and most important salt in the world. There are enormous quantities of it in the sea, and in various parts of the world it is found as what we call rock-salt, which has been formed in past ages by the drying up of bygone seas. Some of the salt we use to-day is obtained by the drying up of sea-water, by which we mean that the water passes into the air in the form of a gas, and the salt which was melted in it is left behind. Salt is found in every living creature, animal or vegetable. It is absolutely necessary for all life—a food which we cannot do without.

SALT IS ONE OF THE COMMONEST NECESSITIES OF LIFE

It is very important to know how much of this sodium chloride, or common salt, is found naturally in various foods. Milk contains enough of it, meat also contains enough of it, but other foods do not. So, practically, we have to add salt to our food, and this is true all over the world. A tax on salt is therefore a tax on a necessary of life. Some of us think that the tax on salt in India is a cruel and wicked thing, though it is a very sure way of getting money, since people must have salt or die. But not only is salt a necessary food for us, as for all living things, but it is also specially valuable as a preservative of other kinds of food, such as fish. Those who understand the chemistry of salt and its relation to life are inclined to think that it is almost the last thing in the world out of which a government should make money.

There was a time when all the elements were divided into two groups—the metals and the non-metals. We group the elements differently nowadays.

THE SIX MOST USEFUL METALS, AND WHAT A METAL IS

We know that there are some elements which are not quite metals, and yet are very nearly metals, and we know that mercury is a metal, though it is not even solid. But still it is worth while to group together a number of the elements as metals, and this number now is something like sixty. In ancient times six metals only were known—iron, copper, tin, lead, gold, and silver. These are still the most widely used metals, though many others have now been found.

Their names are sufficient to give us quite an idea of what a metal is. In

general, metals are solid and opaque, which means that they do not let the light through them; they are heavy, and have a particular sheen or metallic lustre. There are exceptions to all of these characters, as, for instance, mercury, which is liquid, and the metal sodium, which we have just been talking about, which is not heavy, but light.

THE DISCOVERY OF METALS CHANGES THE HISTORY OF MEN

Of course, when only six metals were known, gold was the most costly of them—the noble metal. But now we know many metals which are far rarer and far more valuable than gold. Many of these can be used for special purposes for which neither gold nor any of the common metals is of any use.

So the science of preparing metals is a very important one nowadays, and we now realise that the history of our knowledge of the metals, how to prepare them and how to use them, is a part of the history of mankind. We know now there was a time when men were unable to use any of the metals. They had to make their axes and weapons of stone. After this Stone Age, which men have passed through at various times in all parts of the world, there came the ages when men learnt how to make weapons of metals, bronze or iron. Far more can be done with metals and tools made of metal than with any that can be made of stone. Thus the discovery how to get iron out of iron ore, as it is called, has always meant, when it was made in any part of the world, a new stage in human history there.

IRON IS BY FAR THE MOST VALUABLE OF ALL THE METALS

Though the metals are all more or less like each other, yet they are different in many ways. Some can be hammered flat, some can be drawn into long wires, some will stand great strain, and so on; but of all the many metals by far the most valuable, *in the real sense of valuable*, is one of the commonest and one of the first to be known—namely, iron. This, of course, is an element, and has its own symbol or letter. We do not call it I, however, because that stands for iodine, but we call iron Fe, from its Latin name, *ferrum*. This element is valuable, because it serves man in so many ways. Fortunately, it is very common, though not much of it is to be found free. It is usually found burnt, combined with oxygen; and the way in which to get the iron by itself is to take the oxygen from it by means of carbon.

Men certainly knew how to do this many thousands of years before the birth of Christ, and it was not the kind of thing which, once learnt, would be forgotten, so vastly superior to anything that was known before were the weapons and tools which could be made of this element. In some parts of the world bronze was used for a period before iron was discovered, so that there was a Stone Age, a Bronze Age, and an Iron Age—bronze being a mixture of tin and copper. Long years after this, there is no doubt that people will describe the age in which we live as the Steel Age. Now, steel is not an element, and we may call it a special kind of iron, but we can do things with steel which could never be done with iron; and perhaps steel is as great an advance upon iron as iron was upon bronze or stone.

HOW THE WONDERFUL THING CALLED STEEL IS GOT FROM THE IRON

Nearly all the iron we find is more or less impure, and it all contains a quantity of carbon, as well as many other elements. If we turn out all these other elements except the carbon, if we allow just the right amount of carbon to stay in the iron, and if, in so doing, we comply with a great number of conditions as to cooling, and so forth, then we get that wonderful thing—steel, which we think of as iron with some carbon in it. It has all the virtues of iron, and far more; it is stronger and less brittle; it can take a wonderfully delicate edge, and it will stand an amazing strain, whether used for buildings or bridges or ships or motor-cars.

Now, since steel is so much more wonderful and useful than iron, it seems a very poor explanation of its properties to say that it is just iron with a little carbon in it. Those who are studying steel now take special pains to find out what it is that makes it so useful, or what it is that makes the difference between the steel which lasts and stands strain and the steel which snaps and wrecks a train or lets a bridge crash. That is not merely a

question of iron with a little carbon in it; it is a question of the way in which the steel forms crystals as it cools and becomes solid.

We think of salt and snow and some of the medicines we have to take as crystals. Very few of us have ever thought that all the metals are made of crystals, too, but this is really so. Of course the crystals are very small, and very tightly and beautifully fitted to each other, but a lump of gold or a bar of iron is made of crystals just as certainly as a ball of snow or a piece of ice.

THE LITTLE CRYSTALS THAT GIVE IRON AND STEEL THEIR AMAZING STRENGTH

It is the crystalline structure of iron that makes it so useful, it is the particular crystalline structure of iron containing carbon, in the form of steel, that makes steel the wonderful thing it is, and it is a question of crystalline structure that decides whether there shall be an accident or not in any of the millions of cases in which steel is used every day. If we examine steel under the microscope—which has only lately been used for the study of metals—we can now learn the difference between the kind of steel that you could trust your life to and the kind of steel that would betray you if you trusted it. In the good steel the crystals are beautifully and regularly arranged, holding on to each other on all sides, nor is there any place where some of the carbon has got by itself in between the crystals. This is just enough to tell us of the kind of study now being carried on in various parts of the world, especially in the United States.

Gold and silver are very nice and useful metals in their way, but if all the gold and silver in the world were to vanish at this moment we should soon get along just as well without them. I mean that the use of them is not a real use, like the use of iron, or, at least, the real use they have is only very slight.

WHY GOLD AND SILVER ARE CALLED THE NOBLE METALS

For some purposes we want to have something that is very thin, and this is one of the real uses of gold, for it can be beaten out into thinner leaves than anything else. We say that it is malleable, a word which comes from the Latin, and simply means hammer-able.

Gold and silver are called noble metals, not so much because they are rare or beautiful as because they do not rust. Most metals, when exposed to the air, begin to get rusted or burnt. If there is only a small amount of water in the air, this rusting goes on very quickly. Steel, of course, rusts. You must have noticed that with a pocket-knife.

Now, gold and silver do not rust. They can be exposed to the air, but they do not get burnt, or oxidised, by it. We know that silver things will tarnish in a room, but that is because they are attacked by the sulphur of the air. They do not rust. This is one reason why gold and silver are called noble metals, and another reason is that it is difficult to melt them. Almost the only thing that will melt gold, for instance, is a mixture of two very strong and violent acids—nitric acid and hydrochloric acid. Either of these will make short work of most metals, but neither of them alone can touch gold; only a mixture of them can do so; and so this mixture was long ago called *aqua regia*, meaning the royal water, because it was able to melt the royal or noble metal—gold.

WHY ONE END OF A POKER IS HOT IF YOU PUT THE OTHER END IN THE FIRE

Though they cannot be attacked by the air or by most other tnings, gold and silver are very soft, and when they are used to make coins various other metals have to be added to them, or they would very soon rub away.

We have seen that gold cannot be oxidised in the ordinary way. Even when very special methods are used we still fail to oxidise gold. If we make silver exceedingly hot, however, and expose it to air or to oxygen at a very high pressure, it can be oxidised.

One of the features of the metals in general is that they conduct heat very well. That is why one end of the poker becomes hot when the other is put in the fire, iron being a good conductor of heat. This means, of course, that metals are the worst things we could use to make clothing of; they would make what we should call cold clothing, because it would conduct heat away from our bodies quickly.

Metals are also the best conductors of electricity. No one has yet explained what it is in a metal that makes it conduct heat or electricity so

well, but it is at least very interesting to remember that, as a rule, the things which conduct heat best are also the things which conduct electricity best. Some day we shall probably learn that it is one and the same thing—perhaps the way in which the atoms of these things lie together—that explains their conducting of heat and electricity.

Electricity, about which we shall read later, is every year being used for more purposes. It is the best of all means by which power can be carried from the place where it is obtained—as, for instance, by burning coal—to the place where it is wanted to be used.

WHY COPPER IS USED ALL OVER THE WORLD TO CARRY ELECTRICITY

Hence we yearly have more and more need for things that will carry or conduct electricity, things that it will run through as if it were water running through a pipe. This is one of the great reasons why we use the metals nowadays. The three metals which conduct electricity best are gold, silver, and copper, and as copper is very much the cheapest of the three, it is now used all over the world for carrying electricity. Like silver and gold, a certain amount of copper can be found free in the earth, and it is free copper that we require; but it must be very pure, for if it has any traces of other elements in it, it does not conduct electricity anything like so well. So all the copper which is used for conducting electricity has to be specially prepared, and this is done by splitting up compounds of copper, dissolved in water, by passing an electric current through them, just as we saw that we could split up water itself by passing an electric current through it. A great advantage of copper is that, like silver and gold, it is not burnt or rusted or oxidised at ordinary temperatures.

MERCURY, THE WONDERFUL WATER-SILVER, THE ONLY LIQUID METAL

Just a word must be said here about mercury. It should always be thought of together with copper, silver, and gold, for with these three elements it forms a group of four, which are all related to each other and somewhat like each other. Mercury is, however, peculiar, because it is liquid—the only liquid metal there is. Small quantities of it, as of the others, are found free in Nature. Like the others, it is a very good conductor of electricity. It is a very useful metal, not only because it conducts electricity so well, but also because it can be spread on glass so as to make mirrors. We call this silvering the mirrors. But mercury, or quicksilver, though it looks like liquid silver, is not silver at all, but a perfectly distinct element. When mercury is heated, it expands—that is to say, it occupies more space—in a very regular way, and so it is used in thermometers for measuring the temperature. In somewhat the same way it is used in barometers for measuring the pressure of the air.

Unlike the three other elements of this group, mercury is also a valuable medicine. In some kinds of illness—some of them not serious, and others as grave as illness can be—mercury is not merely the best medicine, but the only one worth mentioning. I had almost said that it saves as many lives every year as are destroyed by men's hunger for silver and gold, but I am afraid that would be an exaggeration. At any rate, if we were allowed to keep only one of this remarkable group of four metals we should certainly choose mercury, and if we were allowed to keep two it would be mercury and copper.

A WONDERFUL GROUP OF GASES AND WHAT THEY TEACH US

There is no need to say anything now about the other metallic elements, though we shall have something to say about some of their compounds afterwards; nor need we say anything about other elements that are not metals, such as arsenic and phosphorus. We must pass on to some wonderful elements that we have not known very long, which will prepare us to learn how all elements are related to each other, and actually made out of a single kind of stuff.

First of all, there is a wonderful group of gases which exist in the air in very small quantities, and have only been found in the last few years, though everyone thought that the composition of the air was completely known. These gases are not important in themselves; they play no direct part in our lives; they only exist in tiny quantities; and they seem to do nothing in the air or anywhere else.

But they are enormously important on account of what they teach us, and their relation to other elements. The first of them, *argon*, was found fifteen years ago, and since then it has been found that what was called argon did mainly consist of a true element to which that name is still given, but also contained very small quantities of four other elements which are now known as *helium*, *neon*, *krypton*, and *xenon*. Helium was already known as existing in the sun, and also in a rare mineral, but no one guessed that it was contained in the air.

THE FIVE MISSING ELEMENTS THAT FIT INTO THE GAP OF KNOWLEDGE

These five elements form a true group, quite as definite as the group of four metals about which we have just been speaking. They have certain common properties which show their relation and distinguish them from all the other elements. More than this, long before their discovery all the known elements had been fitted into a table which showed that they were related in certain groups, and that these groups were related to each other. In this table there was one very conspicuous gap; one of the groups that should have existed in it did not exist at all, it seemed. These five new elements are the missing group, and fit exactly into the vacant space in the table. If there were nothing more to say about them than this, their discovery would still be a great event in the history of knowledge. But, indeed, there is much more to say about them, for we have lately learned where they come from. The first of the series, helium, is the lightest but one of all the elements. We have learned that it is made by the breaking up of one of the heaviest of the elements. Last year we learned that other members of the series are similarly made, and there is now no doubt that what we call the elements are not merely related to each other, but that they can be actually transformed into one another.

HOW THE ELEMENT RADIUM HAS CHANGED OUR IDEAS OF THE WORLD

For a moment, then, we must leave this little group, and must look at the heavy element, as different from any of them as can be, although it is, nevertheless, their parent. On page 655 of this book we have already had something to say about the wonderful element radium, since we have lately learned that it is a producer of heat, that it is distributed throughout the crust of the earth, and therefore helps to keep the earth warm. Nothing more important could be said about any element, as the warmth of the earth is necessary for life, and as the duration of that warmth must decide the duration of life upon the earth.

But radium is really of equal importance to the world of ideas. It gives us not only heat, but new truths, the greatest of which is that the elements must now be looked upon almost as we look upon different kinds of animals and plants, and not as things which have been what they are now and different from each other since the beginning of time. We have little doubt now that radium itself is formed by the breaking up of the atoms of another element called uranium.

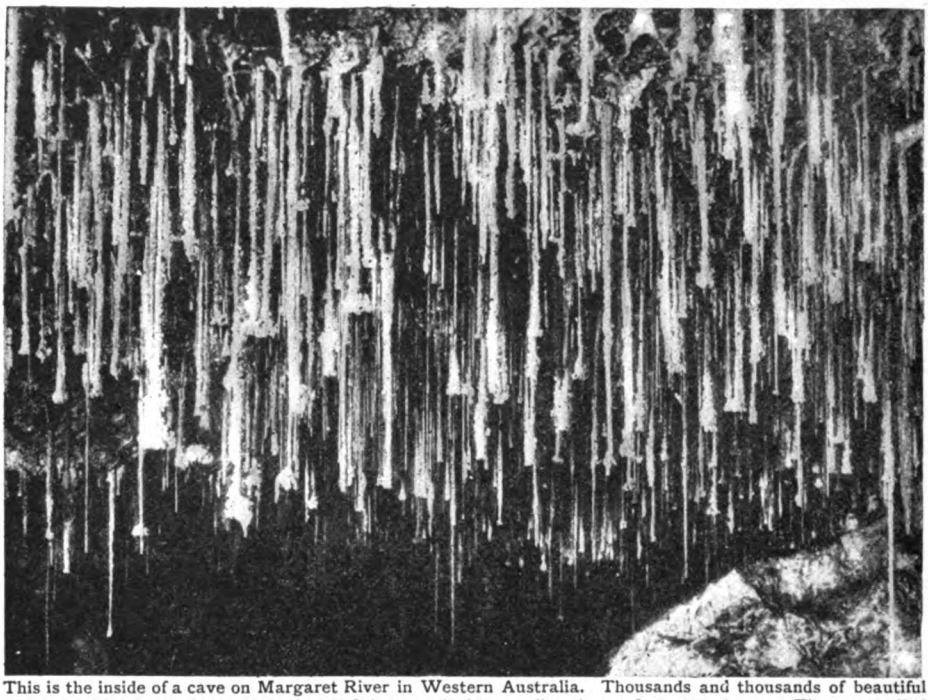
WHAT THE WORLD MAY LEARN FROM THE BREAKING UP OF ATOMS

But radium shows this breaking-up process in its own atoms much more distinctly than does uranium or any other element we know; and it is this breaking up that gives radium its astonishing properties, such as the production of heat and of electricity, and also of various kinds of wave-motions in the ether which are very similar to the wave-motion we call light.

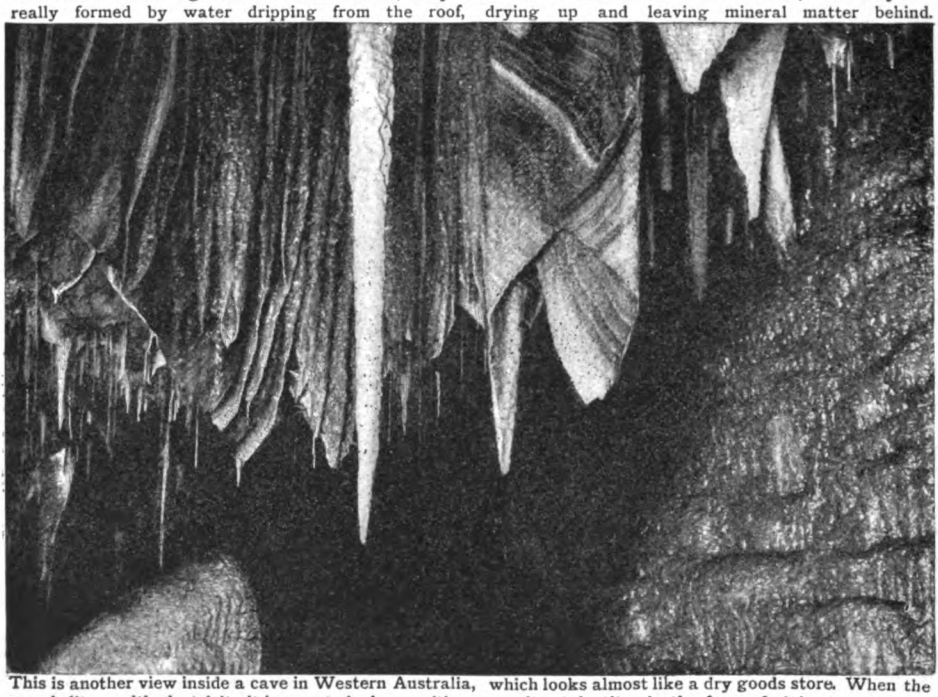
It was this production of heat and electricity, of X-rays and of various other kinds of rays, which first excited our interest in radium. But now we are learning that these things are only the accidental results, so to speak, of the real and essential thing which is always happening in radium, and to which they are all due. This essential thing is that the atoms of radium are breaking up into smaller atoms, several of which have now been recognised. Yet radium is a true element and not a compound, for all the atoms making it are of one kind, as we read on page 1372. We must first see what atoms have been recognised as the offspring, so to speak, of the radium atom, and then we must try to understand the quite tremendous meaning of this discovery, one of the most important that has been made since the dawn of human knowledge.

The next story of the earth is on page 1419.

THE WONDER OF DRIPPING WATER



This is the inside of a cave on Margaret River in Western Australia. Thousands and thousands of beautiful white columns hang down from the roof, long and short, ending in perfect star shapes. They are called stalactites. Seen against the dark cavern, they look like a shower of stone meteors; but they are really formed by water dripping from the roof, drying up and leaving mineral matter behind.



This is another view inside a cave in Western Australia, which looks almost like a dry goods store. When the cave is lit up with electricity it is seen to be hung with pure white stalactites in the form of alabaster columns, showing light through their edges. Many of them glitter like gems, and others form into shapes like folded lace-edged shawls, rugs, tents, and other wonderful things. You might fancy some of them were icicles.

Elizabeth Fry visiting the prisoners in Newgate Prison

THE GENTLE LIFE OF ELIZABETH FRY

And How She Reformed the Prisons

CONTINUED FROM 1180

PERHAPS you have never visited a prison. It is strange to hear the great gate close behind you, and to find yourself standing inside of the high spiked walls which prevent criminals from making their escape into liberty. If you have known this experience, you will understand how pitiful are those words in the Church Litany: "*That it may please Thee to have pity upon all prisoners and captives.*" It is terrible to be a prisoner.

But it was worse, infinitely worse, to be a prisoner a hundred years ago; and for poor women it was so horrible that no language can describe their sufferings. Women, innocent or guilty, those who had been tried by the judge, and those who still were awaiting their trial, women of education and gentleness, and women so low that they were lower than animals—all were thrown together into one prison, among desperate and evil men.

And all this was changed by one noble-hearted woman.

In those days there lived a Quaker lady named Elizabeth Fry, who was deeply religious, and lived her religion by trying to help others. She believed that bad people would become good if they were helped. She herself had once been vain and fond of frivolity. She had known the difficulty of becoming serious and good. When someone asked her about the crime of a certain prisoner, Mrs. Fry would answer, "I never ask the crimes, for we have all come short." It was not of the crimes she thought, but of the soul; she looked into the eyes of prisoners, not into their records.

This noble lady had heard about the prisoners in Newgate, and asked permission to visit them. The first time she went among them the turnkey accompanied her; the second time she went alone. The governor told her of the danger, and advised her to leave her watch behind, saying that he himself would not dare to go alone into that seething yard of crime and sin. But Elizabeth Fry went alone, and she won the hearts of the women prisoners by sheer kindness and sympathy. For the first time they looked into the eyes of a good person, who believed that they could be good. That helped them.

She set herself to start a school among these terrible prisoners. The officials scoffed at the idea, and told her it would be a failure. The school became a great success. Then she set her heart upon giving the prisoners interesting employment. Again, the officials said the idea was impossible. But the industry also became a great

success. Remember that even the kindest people in the world will always tell you that every scheme for the lifting up of fallen people is useless—and it would be useless *in their hands*. It was because Elizabeth Fry *knew* that her schemes would not fail that she carried them to victory. She had faith. She knew that God is on the side of good, and that evil must yield to righteousness.

This good woman was the daughter of a rich man and the wife of a rich man. She might have lived a life of idle enjoyment. She might have sent subscriptions to help good works, and herself remained in the comfort of her home. But every morning when she woke, her thoughts were:

Of the hearts that daily break,
Of the tears that hourly fall.

She cared for the vilest; she sought the most hopeless. So we find her praying on the deck of convict ships, reading the Bible in gaol, sitting all night in the condemned cell of a poor woman to be hanged on the morrow. She was the angel of the prisons. By her aid all the prisons of the world became kinder and better places. There is not now a single woman in gaol who ought not to bless the name of Elizabeth Fry.

Her idea was that a person who does wrong should be handled in such a way that he does not become worse, but better. Prisons are not for punishment, but for improvement. She wanted to teach the worst person in prison that, if he wished, be could become better. Prison is a terrible punishment. To be locked up like a wild beast is a frightful indignity. But even in prisons—which are necessary—the Spirit of Christ can enter, and the most degraded criminal can learn to forget his sufferings in the love and mercy of a Saviour who understands all his difficulties.

Elizabeth Fry *proved* this, and began a great work. Our prisons are better; but we ought to make prison a place which saves everybody who enters it. That is what Elizabeth Fry intended; that is what you must accomplish.

THE BIRD THAT NAPOLEON SET FREE

THERE is one trivial scene in the life of Napoleon which shows us a glimpse of his humanity.

Beaten by the great Duke of Wellington, that master Englishman who "gained a hundred fights, nor ever lost an English gun," Napoleon had ridden, haggard and helpless, into Paris. Early in those terrible hours he closeted hurriedly with a friend named Gourgand, and discussed with him what could be done. Should he surrender to the English, or make his escape to America? While the two men argued in this terrible hour of panic and suspense, a little bird flew in at the open window. The excited Gourgand caught it in his hand.

"An omen of good fortune!" he cried.

Napoleon looked at the poor, frightened bird captive in the hand of a man, and said, "Let it go free. There are enough unhappy beings in the world."

It was a touch of mercy. The mighty conqueror, who had hurled, without a tear, legions of men to destruction, could not bear in his terror to look upon the frightened bright eye of a little bird.

"*Let it go free! Let it go free!*"

THE DAUGHTER OF SIR THOMAS MORE

ONE of the crimes that will be remembered against King Henry VIII. as long as the world lasts is the murder of his greatest subject and the noblest Englishman of that age, Sir Thomas More. And men chiefly remember this crime, perhaps, because they were told in childhood the story of Sir Thomas More's daughter, the beautiful and heroic Margaret Roper.

Sir Thomas More was the son of a judge, Sir John More, and while his father was yet living, the son was made Lord Chancellor. So he became his father's chief. But such was the noble nature of this man, that when on his way to Court he encountered his father, he would kneel down before him and ask his blessing.

He was one of the greatest scholars of that day, and his stately house at Chelsea was always crowded with distinguished people anxious to hear his bright and wise conversation. His children and their children were ever close to him, but none was so faithful

THE FAITHFUL DAUGHTER OF SIR THOMAS MORE CHEERED THE LAST HOURS OF HER FATHER

to him, so gentle and helpful in trial, as the lovely Margaret, wife of William Roper.

And when evil times fell, and for conscience' sake Sir Thomas More was thrown into prison, it was Margaret who proved his chief comfort. His wife did not understand him.

"Why do you live in this filthy prison with rats and mice," said she, "when you might sit at the King's right side and enjoy yourself at home?"

To which the great man replied with a smile:

"I pray thee, good Mrs. Alice, tell me one thing—is not this house as near heaven as my own?"

Margaret understood him better, and cheered him in his disposition to defy the King. But her heart was near breaking. After his trial, when he had been condemned to death, this daughter broke through the soldiers surrounding him, flung her arms about his neck, and cried:

"Oh, my father!—oh, my father!" And he laid his hand on her head and blessed her.

She parted from him only to return, once more flinging her arms impulsively about him, and kissing him with such an agony of affection that even the soldiers wept. And when she got home she received a letter from her father written in charcoal:

"I never liked your manner better than when you kissed me last; for I am most pleased when daughterly love and dear charity have no leisure to look to worldly courtesy."

The head of this splendid man was set on a pole on London Bridge, but it soon vanished. No one knows how, but Margaret Roper obtained it in some way, and the news soon got whispered that she was the thief.

Then was this gracious lady summoned to attend before the King's council, and there, unaffrighted, she owned that the head was in her possession. So noble was her manner in making this declaration that no man dare punish her, and she was allowed to keep the sacred relic. It was ever with her, and when she died it was buried in her arms.

The next Golden Deeds are on page 1653.

THE GREAT THINKERS OF GREECE IN THE GOLDEN DAYS OF ATHENS

This picture of "The School of Athens," painted by Raphael on the walls of the Pope's palace in Rome, represents the great men of Greece. Coming down the steps, in the centre, are Plato and Aristotle, with their disciples. On the left are Socrates talking to Xenophon, and Alcibiades in his helmet. Underneath are Democritus and Pythagoras; on their right sits Heraclitus. On the steps, to the right, lies Diogenes, and above, to his right, Aristippus talks to Epicurus, Pyrrho, Arcesilaus, and others. Below is Archimedes, teaching geometry.

WHAT THIS STORY TELLS US

THERE were three peoples in ancient times who in one way or another did much to shape the history of the nations that lived after them. These three were the Hebrews, of whom we read in the Bible; the Romans, about whom we have read already; and the Greeks, about whom we read in these pages. Indeed, there are some people who declare that if anyone says or thinks of anything very wise or very beautiful, we shall find that there was some Greek who said or thought of the very same thing more than 2,000 years ago. Moreover, it is remarkable that nearly all of the greatest of the Greeks belonged to one city, Athens, so that, out of the eleven men about whom we have to read here, six were Athenians, and the eleven number among them not only some very great statesmen, and one of the greatest of all soldiers, but also three of the wisest men who ever lived.

THE GREAT MEN OF GREECE

CONTINUED FROM 1262

WE will begin with Solon, the Athenian. For it was he who set the State of Athens in order, so that after his time it was difficult for the rich people, or people proud of their high birth, to oppress those who were poor and humbly born. When he was a young man he travelled much; and, returning to Athens, he soon won fame by persuading his countrymen not to submit to their enemies, and by leading them successfully in battle. Then, when there was great discontent and trouble between the rich and the poor, both asked Solon to make new laws which would be fair to both, and he made them promise that they would not change his laws for ten years without his leave. And when he had made the new laws he went away, knowing that if he stayed many would ask him to change the laws again; but that after ten years they would have learnt that the laws were good, and would not wish to change them. And so it fell out.

The story is told how he showed his wisdom when he came in his travels to the Court of Crœsus, the King of Lydia, who was one of the mightiest kings, and the richest in the world. Crœsus, having shown Solon his great riches, asked him who he thought was the happiest of men, counting that he would answer, "Crœsus, the King." But Solon said, "Tillus, the Athenian; for he lived honourably, and begat noble sons and fair daughters; and at the last he fell in battle gloriously, having given victory to his country." Then, Crœsus asking, "And the next?" Solon made answer, "Cleobis and Biton, whose mother prayed the gods to grant the best of all gifts to her sons for the utter love and tenderness they had shown to her; and on the morrow the twain were found dead. For he is happiest who dies most happily; and no man may be counted happy until he is dead." But of Solon's own dying we know only that he was full of years and honour.

But we may be assured that he would have accounted happy Leonidas, the Spartan, who comes into our talk for one most glorious deed. For when the King of Persia made war upon the Greeks, and marched against them, as men say, with the greatest army that ever was seen, he must make his way into Greece through a mountain pass which is called Thermopylæ. And here, because the way is so narrow that but four men could march into it together, the Greeks could have held him at bay with an advance guard of but a few thousand men, till all their forces should be gathered;

and at the head of these was set the Spartan king, Leonidas.

But when it was found, after the Greeks had already beaten back an attack, that there was another way, so that a Persian host might pass behind them and attack in great numbers, then Leonidas sent back most of his army, seeing that those who abode at Thermopylæ must be overwhelmed.

HOW LEONIDAS AND HIS HEROES DROVE BACK THE PERSIANS AT THERMOPYLÆ

But he, with three hundred men of Sparta and seven hundred from Thespiæ, resolved that they would remain and die at their post. And when one said that if they went out to battle against the Persians the very sun would be hidden from them by the flights of the Persian arrows, answer was made, "The better, for so we shall fight in the shade."

Then Leonidas would wait no longer behind the ramparts that had been built; but he and his men, having made ready as if they were going to some festival, marched out in battle array and charged across the open upon the myriads of the Persians, and slew many thousands of them before the last of their own number had fallen. So that the fame of Leonidas and his three hundred Spartans and the seven hundred Thespians has rung across the ages, like a trumpet-call, to deeds of valour from that day until now.

Yet it was not Leonidas, the Spartan, who overthrew the Persians, but Themistocles, the Athenian; for the numbers that Leonidas had slain at Thermopylæ was but a tiny part of the Persian king's army which set forth against the Greeks. Now, they would have had a hard task to fight their way across the narrow isthmus of Corinth into the south of Greece, but Athens lay an easy prey for them.

THEMISTOCLES MAKES ATHENS STRONG BY SEA AND WINS A GREAT BATTLE

This very clever Athenian, Themistocles, however, had seen that his city might become very powerful if she had a great fleet; and by his counsel the Athenians had built many ships, and had become the most skilful sailors of all the Greeks. And now the men of Athens went to their ships, having set their women and children on an island hard by; and it was now the counsel of Themistocles that they should do battle with the Persians by sea; for if they beat them on the sea, then the Persians, being so far from their own country, would find themselves in danger by land also. The Greeks of the south, which is called Peloponnesus, thinking their own land secure, were not eager to fight by sea, but Themistocles was so sure of winning, that when some of the Greeks talked of sailing away, he sent a message to the Persians bidding them send ships and block up the way of escape, pretending that he had goodwill toward them. So when the other Greeks found there was no other way, they made ready for a sea fight.

Then was fought the battle of Salamis, which was won chiefly by the skill and valour of the Athenian fleet, led by Themistocles. And the battle of Salamis really decided the war, though afterwards there was another great battle by land, in which also the Greeks were victorious. But in later days Themistocles quarrelled with the Athenians, and betook himself to the King of Persia, making pretence of friendliness; and he died in Persia, having taken poison, men said, to kill himself.

ATHENS BECOMES POWERFUL AND BEAUTIFUL UNDER THE RULE OF PERICLES

After Themistocles had gone from Athens, the guidance of the affairs of the city came, before very long, into the hands of a great statesman named Pericles. Now he, like Themistocles, saw that the greatness and the power of Athens depended on the strength of her fleet; and he made it his aim to set Athens at the head of the sea-going states, so that all should be, not exactly her subjects, but united in a league of which she was the acknowledged chief.

Under his guidance Athens increased not in power only, but in wealth and beauty and knowledge. For the greatest of sculptors, Phidias, and great poets such as Sophocles lived at Athens, and it became the most beautiful city in the world; and the wisest of the men and women of the time were the friends of Pericles. There are many people who think that of all Greek statesmen he was the greatest, and certainly there was none who did more for the good of his own city of Athens. And yet not Pericles nor any other thought of trying to unite the Greeks into one great

THE CONQUESTS OF ALEXANDER THE GREAT

Alexander, the son of King Philip of Macedon, succeeded to his father's kingdom when quite a young man. He led a small army of the Greeks against the vast host of Persians under Darius, and won three great victories. This picture shows the final victory at Arbela over an army which is said to have numbered a million men.

After the battle of Arbela, Alexander entered Babylon, the most famous city of the Old World, and met with no resistance. He was always very considerate of the religion of the nation he conquered, and on entering Babylon, as seen in this picture, he offered the customary sacrifices, and commanded the temple of Bel to be rebuilt.

nation, which could act in harmony; but all the cities remained separate, so that there were endless strifes and rivalries between city and city.

Of all these rivalries the greatest was between Athens and Sparta. For Sparta thought to set herself over all the Greeks; but Athens, with Pericles guiding her, would not suffer Sparta to rule after this fashion, and gave aid to other cities which would not obey the Spartans, and there was war, so that in the hour of the death of Pericles, and for some while after, it seemed as though Athens might become the leader of all the Greeks. But after him there was none who could see so clearly and rule so wisely as he; and Athens was worsted, through striving to make a wider empire than she was fit for.

Thus the Spartans won the chief power, so that nearly all the states of Greece had to bow to their will, though they were not altogether subject to her. And then it was not Athens, but a neighbour state called Thebes, which set Sparta at defiance, and for a short time became the most powerful of the Greek states.

THE TWO FRIENDS WHO SAVED GREECE FROM THE TYRANNY OF SPARTA

This was due mainly to two men —Pelopidas and Epaminondas—who were very dear friends; but most of all to Epaminondas. Pelopidas was a man of great wealth, very generous, a very daring soldier, and well beloved. But Epaminondas was poor.

Yet, of the two, Epaminondas did more; for, in the first place, he did not care about his own greatness at all; and, in the second place, he did not seek to make Thebes great only for the sake of Thebes, but that his city might deserve well of all the Greeks. And he trained himself in body and mind, so that there was nothing he could not do well, whether to persuade men by speech, or to fight valiantly himself, or to train an army and lead it in war. And when the Thebans chose him, with his friend Pelopidas, to lead them, he gave defiance to Sparta, whose soldiers were thought to be invincible, and by his skill as a general he overthrew them at the battle of Leuctra, though their numbers were the greater. And the Thebans won freedom for other states from the tyranny of Sparta. But at last, when Epaminondas was warring against Sparta, there was a great battle at Martinea, and the Spartans were routed. In the hour of victory Epaminondas received a mortal wound, and, in their grief at the loss of their loved chief, his men had no care to pursue the foe; nor was any left after him to carry on his work as a statesman or even as a soldier, so that the strifes and rivalries of the Greek states continued.

THE COMING OF KING PHILIP OF MACEDON AND HOW HE TRIED TO RULE GREECE

While the Greek states continued to waste themselves in their rivalries, there was being built up northward, in Macedon, a powerful kingdom, which was Greek, too, although it had been less civilised than the rest of Greece. The building up of the power of Macedon was for the most part the work of the crafty King Philip, and soon men began to see that Philip meant to make Macedon the head of all the Greek peoples. Moreover, to some it seemed that Philip would not be content with that, but intended really to make himself master of the whole land. Therefore the great orator Demosthenes tried hard to make the people of Athens oppose the plans of Philip.

Now, this Demosthenes was one of the most wonderful orators in the world, so that to this day people study his speeches in order to learn how to speak so as to persuade multitudes of people. It is said that he made himself so good a speaker that he could speak quite distinctly with pebbles in his mouth, and could recite poetry aloud though he was running uphill; and he studied very hard so as to learn the best possible way of expressing whatever he wished to say.

HOW DEMOSTHENES THE ORATOR WAS DRIVEN INTO EXILE TO DIE

Now, Demosthenes could not make the Athenians strong enough to resist Philip; still, he spent the best part of his life in trying to encourage the Athenians and to persuade other Greek states to help them. The speeches which he made against Philip are called the "Philippic Orations," and so when other people make speeches of the same kind they are called "Philippics." After Philip was dead, and when his son Alexander the Great was in Asia, the Regent of Macedon caused

THE LAST HOURS OF TWO GREAT MEN

Socrates was the man of thought, one of the wisest teachers among the Greeks. He was a very ugly old man, but won many friends and followers. He taught that the greatest thing in the world was knowledge, and that the most important kind of knowledge was for a man to know himself. The Athenians, however, did not like his influence over the young men, so they condemned him to poison himself by drinking hemlock, as seen here.

Alexander the Great was the man of action and energy. During ten years he led a mighty army and conquered Persia, Egypt, and Phœnicia, and even marched on to India, where he defeated a brave king named Porus. No king had ever before ruled over so vast an empire as Alexander, who is said to have sighed for other worlds to conquer. When only thirty-three years old, however, he died of fever, and his empire fell to pieces.

Demosthenes to be sent away from Athens; but afterwards the Athenians revolted and Demosthenes came back.

The Macedonians had him driven out again, but when his enemies went in pursuit of him he knew that he would be put to death, and so he chose rather to die by taking poison himself.

ALEXANDER THE GREAT, WHO BECAME CONQUEROR OF ALL THE KNOWN WORLD

During the last twelve years of the life of Demosthenes, Alexander the Great, the son of Philip of Macedon, made himself one of the most famous conquerors of all time, though he was only thirty-three years old when he died. For he had already learned war-like skill from Philip; and Philip, when he had made Macedon the chief of the Greek states, had already planned that the Greeks should send an army to make war on the great kingdom or empire of Persia, although the Persian king's dominions reached all the way from the borders of India to the Mediterranean Sea, and even Egypt belonged to him; and the Greeks could only send a very small army against his great one.

Still, when Alexander was only twenty-three, he led his army into Asia Minor, which was the western part of the dominions of King Darius of Persia, and there he routed the Persians at the battle of the Granicus. Then Darius met him with another great army at Issus, and was routed again. After that, Alexander decided first to conquer the western lands completely, and he overthrew the cities of Phœnicia, which is just on the north of the Holy Land, and then Egypt made submission. Then he marched again against Darius, and overthrew him utterly at Arbela; and soon after that Darius was murdered.

DEATH CONQUERS THE CONQUEROR AND HIS SOLDIERS BREAK UP HIS EMPIRE

But when Alexander had conquered the whole Persian Empire he was still not satisfied, but marched on into India, and there he overthrew a brave Indian king who was called Porus; so that no king in the world before Alexander had ever been the lord of so vast an empire. All this Alexander did in ten years. But he had no chance of doing more, for very soon after he died of a fever, and the generals of his army divided the great empire up among themselves.

Between the time of Pericles and the time of Alexander there lived three of the very wisest among all men. The first was Socrates, who was born just at the time when Pericles was becoming well known in Athens; and the next was Plato; and the third was Aristotle. They were all philosophers, which means, in the first place, lovers of wisdom; and that is a name given to people who care more about knowing what is true and good than about worldly success, and try to help other people how to think, which is a very much more difficult thing than some people suppose.

PLATO AND SOCRATES, THE LEADERS OF THE WISE MEN OF ATHENS

Now, both Plato and Aristotle wrote a great many books; but Socrates wrote no books at all. However, we know a good deal about him; because, for one thing, a man named Xenophon, who admired him very much, wrote a book about him; and, for another thing, there was a great dramatist at Athens who used to laugh at him, and bring him into his plays for other people to laugh at; and, besides that, Plato has shown us still more clearly what kind of man he was; for Plato wrote a great many of his books in the form of "dialogues," or conversations, in which Socrates is supposed to be talking to other people.

And though we may be pretty sure that, when Plato wanted to teach people something, he often pretended that it was Socrates from whom he had learned it, though he had really thought of it himself, still, we know from that the kind of way in which Socrates must have been in the habit of talking, and that he was not only wise and good, but witty as well, and that his friends loved him deeply.

It was a curious thing that the Greeks, who were usually good-looking, found it difficult to believe that anyone could be both wise and ugly; but Socrates was quite ugly. Still, he was strong and sturdy, and when he had to go to fight in the Athenian armies he was a good soldier. But there was one very odd thing about him, which was that now and then he would suddenly fall into a trance, and stop quite still, unconscious of anything that was going on about him; and then the trance

TWO OF THE WISEST MEN OF GREECE

Plato and Aristotle, whom we see here walking down the steps of the famous School of Athens, were the most famous philosophers of the Old World. Plato, a disciple of Socrates, is pointing upwards to heaven, indicating that his teaching treated more of the poetical and spiritual, while Aristotle, the pupil of Plato, is pointing to the earth, indicating that his teaching dealt with Nature and the understanding of the world. The word on the book in Plato's hand means "I reverence," and that on Aristotle's means "Ethics" or "Morals," about which he taught. Both philosophers used to lecture to their followers in a school outside Athens, and Raphael, one of the world's great painters, has painted them here coming together from this school.

would come to an end, and he would go on just as if nothing had happened.

Now, Socrates thought that the most important thing in the world to get is knowledge and the most important kind of knowledge is to know yourself, because the better you know yourself, the more you see how little you really know, and how much of what you think you know may be quite wrong.

How Socrates was condemned to die for making people think

And by always asking people why they thought this or that, he set them thinking and trying to see the reason of things. But people who had no good reason for what they thought got annoyed, and when they found young men beginning to say that things were wrong which they had been in the habit of calling right, they said that Socrates was corrupting the young Athenians.

So Socrates was brought before the judges for misleading people—just as at the time of the Reformation people used to be tried and punished for teaching what was called heresy; and he was condemned to death, and was made to drink hemlock. But his friends were allowed to see him when he took the poison; and all the time he was dying he talked cheerfully to them, having no fear of death; and his talk was chiefly intended to help them to feel sure, as he was himself, that we have souls which are immortal, and do not die when our bodies die.

Plato, the pupil of Socrates, and Aristotle, the pupil of Plato

Plato was one of the young men who were disciples of Socrates, and he went on teaching people afterwards what he had learned from Socrates, and a good deal more which he saw must be true if what he had learned from Socrates were true. The books that he wrote are very wise, but are written in such a delightful way that anyone who can understand them loves them—though sometimes they are very difficult indeed to understand, because the things he tried to explain still puzzle very wise people.

After Plato came Aristotle, who was a pupil of Plato's, tutor to Alexander the Great. He, too, wrote many books; but he did not look at things quite in the same way as Plato, and because people who love knowledge for its own sake are sometimes inclined to look at things in Plato's way and sometimes in Aristotle's way—but none can help doing it in the same sort of way as one or the other of them—it is sometimes said that all philosophers are either Platonists or Aristotelians, even though they may not think so themselves. For Plato thought in the way that poets think, and Aristotle thought in the way that men of science think.

It is a curious thing that Aristotle did so much to teach men how to set about finding out the way in which Nature works, that a time came—hundreds of years later—when people began to think it was really wicked to say that Aristotle could have ever made a mistake. And, on the other hand, many people have found that, though they were Christians, they understood their own religion all the better when they had studied the teachings of Plato, though he died more than three hundred years before Jesus was born.

The last of the men with the ancient spirit of Greece

After those days the Greek states seemed to lose their power of giving the world men of the greatest kind; they seemed to be depressed by the leadership of Macedon; and a long time afterwards they were swallowed up in the great Roman Empire. But there is one man who lived not very long before that happened whose name deserves to be remembered. This was Philopœmen, who was afterwards called "the last of the Greeks," which meant that he was the last of the men of importance who showed the old Greek spirit of fearless courage and high-minded patriotism. He tried to persuade the different cities of Greece that they ought to think of each other not as rivals, but as one nation.

Philopœmen was famous for daring and skilful leadership in time of war, and was honest and free from self-seeking. Once, when he arrived at an inn, the inn-keeper's wife thought that he was Philopœmen's servant, and set him to lay the table and wash the dishes, until her husband came in and recognised him. In the end he was thrown from his horse, taken prisoner, cast into a dungeon underground, and poisoned; and in this way died "the last of the Greeks."

The next stories of men and women begin on page 1467.

GULLIVER'S TRAVELS

A FEW years after "Robinson Crusoe" was published, one of the greatest satirical stories in our language appeared. This was "Travels into Several Remote Nations of the World," the author of which called himself "Lemuel Gulliver." The first part appeared in 1726. It was written just like a book of real travel, but its purpose was to satirise the England of that time, to laugh at its follies. The story is extraordinary, and people liked it because it was so unusual. It has been a favourite with young folk for many generations, as the adventures it describes are so quaintly impossible that they are interesting quite apart from their inner meaning. The author was the Rev. Jonathan Swift, Dean of St. Patrick's, Dublin. In our description we shall use the original words as often as possible, to show the style of the writing. Lilliput is meant for England, and the war with Blefuscu about the eggs is meant to ridicule the stupid reasons nations had for making war, on provocation of the slighest character.

GULLIVER IN LILLIPUT

How He Became a Captive of the Little People

CONTINUED FROM 1238

LEMUEL GULLIVER tells us that his father had a small estate in Nottinghamshire, and that he was the third of five sons. He was bound apprentice to an eminent surgeon in London, and his father now and then sending him small sums of money, he laid them out in learning navigation, as he believed that some day he would travel, and this knowledge would be useful to him. He did become surgeon successively in two ships, and made several voyages to the East and West Indies. His hours of leisure on these voyages were spent in reading the best authors; and, when he was ashore, in observing the manners of the people, as well as learning their language.

Gulliver afterwards accepted an offer from Captain Prichard, master of the Antelope, who was making a voyage to the South Sea, and set sail from Bristol, May 4th, 1699. They were driven by a storm to the north-west of Van Diemen's Land, where they were tossed on a rock. Six of the crew, of whom Gulliver was one, launched a lifeboat and got into it, but in about half an hour it was upset. What became of his companions he did not know, but he swam as fortune directed him; and when he was almost gone he found himself within his depth, and so reached the shore. We may let Gulliver tell his own story as nearly as possible in the original words whenever we can; and so we shall hear how he fared after he succeeded in getting safe, though exhausted, to the land.

"I lay down on the grass and slept. When I awaked I was unable to stir. My arms and legs were fastened to the ground; my hair was tied down in the same manner. I felt several ligatures and bindings across my body. I could only look upwards. The sun began to grow hot, and the light offended my eyes. I heard a confused noise about me. In a little while I felt something alive moving on my left leg, and, advancing gently forward over my breast, it came almost up to my chin. Bending my eyes downwards as much as I could, I perceived it to be a human creature not six inches high, with a bow and arrow in his hands, and a quiver at his back.

"In the meantime, I felt at least forty more of the same kind following the first. I roared so loudly that they all ran back in a fright; and some of them (I was afterwards told) were hurt with the falls they got by leaping from my sides upon the ground. However, they soon returned. I lay

all this while in great uneasiness. At length, struggling to get loose, I broke the strings, and wrenched out the pegs that fastened my left arm to the ground. There was a great shout. In an instant I felt about a hundred arrows discharged on my left hand, which pricked me like so many needles. Besides, they shot another flight into the air, as we do bombs in Europe, some of which fell on my face, which I immediately covered with my left hand. I then thought it the most prudent method to lie still.

"When the people observed that I was quiet, they discharged no more arrows; but by the noise I heard I knew their numbers had increased; and about four yards from me, over against my right ear, I heard a knocking for above an hour. Turning my head as well as the pegs and strings would permit me, I saw a stage erected, about a foot and a half from the ground, capable of holding four of the inhabitants, with two or three ladders to mount it, whence one of them, who seemed to be a person of quality, made me a long speech, whereof I understood not one syllable.

How the Lilliputians fed the Man-Mountain

"But, before he began, he cried out three times, whereupon about fifty of the inhabitants cut the strings that fastened the left side of my head, which gave me the liberty of turning it to the right, and of observing the person and gesture of him that was to speak. He appeared to be of middle age, and taller than any of the other three who attended him. He acted every part as an orator, and I could observe many periods of threatenings, and others of promises, pity, and kindness.

"I answered in a few words, but in the most submissive manner, lifting up my left hand, and both my eyes to the sun, as calling him for a witness; and, being almost famished with hunger, I put my finger frequently on my mouth to signify that I wanted food. The Hurgo (for so they call a great lord, as I afterwards learnt) understood me very well. He descended from the stage, and commanded that several ladders should be applied to my sides, on which above an hundred of the inhabitants mounted and walked towards my mouth, laden with baskets full of meat, which had been provided and sent thither by the King's orders, upon the first intelligence he received of me.

"I observed there was the flesh of several animals, but could not distinguish them by the taste. There were shoulders, legs, and loins, shaped like those of mutton, and very well dressed, but smaller than the wings of a lark.

Gulliver drinks at one draught no less than 108 Lilliputian gallons!

"I ate them by two or three at a mouthful, and took three loaves at a time, about the bigness of musket bullets. They supplied me as fast as they could, showing a thousand marks of wonder and astonishment at my bulk and appetite. I then made another sign that I wanted drink.

"They found by my eating that a small quantity would not suffice me; and, being a most ingenious people, they slung up with great dexterity one of their largest hogsheads, then rolled it towards my hand, and beat out the top. I drank it off at a draught, which I might well do, for it did not hold half a pint (though 108 Lilliputian gallons), and tasted like a small wine of Burgundy, but much more delicious. They brought me a second hogshead, which I drank in the same manner, and made signs for more but they had none to give me."

After this, Gulliver tells us that he went to sleep, and slept for about eight hours, the Lilliputians having dabbed his face and hands with an ointment which removed all smart of their arrows.

Fifteen hundred horses draw the Man-Mountain to the capital

By the Emperor's orders the physicians had mingled a sleeping potion in the wine given to Gulliver, who supplies an entertaining description of the way in which he was conveyed to the Lilliputian capital on an engine contrived by a small army of engineers and carpenters, and drawn by fifteen hundred of the Emperor's largest horses. There was outside the capital an ancient temple, the largest in the kingdom. The great gate was about four feet high and two feet wide, and through this he managed to creep. To the portal of this temple he was for a time chained by his left leg.

Some hundred thousand of the inhabitants came out to view him, and

GULLIVER BOUND AND GULLIVER FREE

Gulliver had been driven ashore from a wreck on to the coast of a strange land, which turned out to be Lilliput. As he lay asleep, the Lilliputians, none of whom was bigger than one of Gulliver's fingers, found him and secured him to the earth with numerous ropes and pegs. But when he awoke and began to wrench himself free, he shook many of the little people off him like flies, and they had to attack him with whole regiments of archers to make him lie quiet before they conveyed him, with infinite labour, to the capital of Lilliput.

It was no easy matter for Gulliver to accept the king's invitation to inspect the royal palace, as he could not step over the houses and walls without knocking some of them down. But at length, by making a stool out of some of the trees he found growing in the royal park, he was able to step across without damaging the buildings, though in order to look into the rooms in the upper storeys he had to lie down in the great square of the palace. The queen came out on her balcony, and, smiling very graciously upon him, gave him her hand to kiss.

his guards numbered ten thousand. He continued to lie on the ground of the temple for about a fortnight, when the Emperor caused a bed to be made for him, six hundred beds of the common measure being used for this purpose. An Imperial proclamation was issued, obliging all the villages nine hundred yards round the city to provide the prisoner with food and drink, payment for which was to be made from the Imperial treasury. The allowance stipulated for was sufficient for the support of one thousand seven hundred and twenty-eight Lilliputians.

An establishment of six hundred domestics was also arranged for him. Further, three hundred tailors were appointed to make him a suit of clothes after the fashion of the country. The land appeared, he says, like a continued garden, and the enclosed fields, which were generally forty feet square, resembled so many beds of flowers.

Proclamations were issued directing all who had beheld the Man-Mountain, as he was called in the language of the country, to return home and not presume again to come within fifty yards of his house without licence from the Court, "whereby the Secretaries of State got considerable fees."

GULLIVER AT THE ROYAL PALACE OF LILLIPUT

One day the Emperor desired Gulliver to stand up like the Colossus, with his legs apart, and marched his troops under him. The troops so engaged numbered three thousand foot and a thousand horse.

At last, upon certain conditions, Gulliver was given his liberty, and was allowed to see the capital. The people had notice by proclamation of his design to visit the town, which was surrounded by a wall two feet and a half high, and at least eleven inches broad, and flanked with strong towers ten feet apart.

"I stepped over the great western gate (he tells us), and passed very gently, and sideling, through the two principal streets, only in my short waistcoat, for fear of damaging the roofs and eaves with the skirts of my coat. The garret windows and tops of houses were so crowded with spectators that I thought in all my travels I had not seen a more populous place. The two great streets are five feet wide. The lanes and alleys, which I could not enter, are from twelve to eighteen inches. The town is capable of holding five hundred thousand souls. The houses are from three to five storeys, the shops and markets well provided. The Emperor's palace is in the centre of the city. It is enclosed by a wall two feet high, and twenty feet distant from the buildings.

GULLIVER CANNOT WALK IN THE PALACE FOR FEAR OF KNOCKING IT DOWN

"The outward court is a square of forty feet, and includes two other courts; in the inmost are the Royal apartments. The buildings of the outer were at least five feet high, and it was impossible for me to stride over them without infinite damage to the pile, though the walls were strongly bu.lt of hewn stone, and four inches thick.

"At the same time the Emperor had a great desire that I should see the magnificence of his palace; but this I was not able to do until three days after, which I spent in cutting down with my knife some of the largest trees in the Royal park about a hundred yards distant from the city. Of these trees I made two stools, each about three feet high, and strong enough to bear my weight.

"The people having received notice a second time, I went again through the city to the palace, with my two stools in my hands. When I came to the side of the outer court I stood upon one stool, and took the other in my hand. This I lifted over the roof, and gently set it down on the space between the first and second court, which was eight feet wide. I then stepped over the buildings very conveniently from one stool to the other, and drew up the first after me with a hooked stick.

THE EMPRESS OF LILLIPUT IS VERY GRACIOUS TO GULLIVER

"By this contrivance I got into the inmost court, and, lying down upon my side, I applied my face to the windows of the middle storeys, which were left open on purpose, and discovered the most splendid apartments that can be imagined. There I saw the Empress and the young princes in their several lodgings, with their chief attendants about them. Her Imperial Majesty was pleased to smile very graciously upon me, and gave me out of the window her hand to kiss."

THE ARMY OF LILLIPUT MARCHES PAST

One of the most curious incidents in Gulliver's sojourn among the Lilliputians was when the Emperor of Lilliput had the happy idea of making Gulliver stand up like the great Colossus statue with his legs apart, and marched the royal army of 300,000 foot and 1,000 horse between the gigantic legs of the captive Man-Mountain.

But a little while after Gulliver found that there were two struggling parties in the Empire of Lilliput, under the names of Tramecksan and Slamecksan, from the high and low heels on their shoes, by which they distinguished themselves. In addition, there was a threat of invasion from the Island of Blefuscu, the other great empire of the universe. The long-standing trouble between these two mighty empires arose out of the following incident.

The grandfather of the Emperor of Lilliput, when a boy, as he was going to eat an egg, broke it at the larger end, according to the ancient practice, and cut one of his fingers. Whereupon the Emperor, his father, published an edict commanding all his subjects, upon great penalties, to break the smaller end of their eggs. This led to rebellion and civil discord, which were fomented and encouraged by the Emperor of Blefuscu, at whose court the Big-Endian exiles found much favour.

Gulliver, having expressed his readiness to defend the person and state of the Emperor of Lilliput against all invaders, captured the fleet of Blefuscu by the simple plan of swimming out to meet it and fastening cords to each boat, wherewith, after cutting their cables, he, "with great ease drew fifty of the enemy's largest men of war" into the Royal port of Lilliput. They attacked him with their arrows all the while, of course, but he did not mind that, as he wore a pair of spectacles to protect his eyes.

But because Gulliver protested against the Emperor's revengeful design for reducing the whole of the rival empire into a province and destroying the Big-Endian exiles, he fell into disfavour.

Being informed of a design to accuse him of high treason, he made his escape to Blefuscu, whence, by a lucky accident, he secured the means of reaching his own country again, and returned to England on April 13th, 1702.

GULLIVER IN THE LAND OF BROBDINGNAG

And What Befell Him Among the Giants

LIKE Robinson Crusoe, Gulliver had a passion for travel. On the 20th of June following his return from Lilliput, he again sailed, this time for Surat, in the Adventure. About a year later this vessel was driven in an eastward direction, past the Molucca Islands. The ship being in need of water, the captain sent a party ashore in the long-boat, Gulliver being of the number. When they came to land, Gulliver wandered about a mile away from the sea.

Returning to the creek, he saw the men already in the boat, and rowing for life to the ship. He was about to holloa after them, when he observed a huge creature walking after them in the sea. But the men having the start, escaped. "This," he says, "I was afterwards told, for I durst not stay to see the issue of that adventure, but ran as fast as I could the way I first went, and then climbed up a steep hill, which gave me some prospect of the country."

He found it fully cultivated; but what first surprised him was the length of the grass, which in those grounds that seemed to be kept for hay was about twenty feet high. He came upon a high road, so he imagined, though it served to the inhabitants only as a footpath through a field of barley! Here he walked for some time, but could see little on either side, it being now near harvest, and the corn rising at least forty feet.

"I was an hour (he goes on to say) walking to the end of this field, which was fenced up with a hedge of at least 120 feet high, and the trees so lofty that I could make no computation of their altitude.

"I was endeavouring to find some gap in the hedge, when I discovered one of the inhabitants in the next field advancing towards the stile, of the same size with him whom I saw in the sea pursuing our boat. He appeared as tall as an ordinary spire-steeple, and took about ten yards at every stride. I was struck with the utmost fear and astonishment, and ran to hide myself in the corn, looking back into the next field. I heard him call in a voice many degrees louder than a speaking trumpet; but the noise was so high in the air that at first I certainly thought it was thunder. Whereupon seven monsters like himself came towards him with reaping-hooks in their hands, each hook about the largeness of six scythes."

Whilst Gulliver was lamenting his folly and wilfulness in attempting a second voyage against the advice of all his friends and relations, and had hidden in a ridge for fear, one of the reapers approached so near as to make him apprehend that with the next step he should be squashed to death under foot or cut in two with the reaping-hook. He screamed as loudly as he could.

THE TREMENDOUS GIANT WHO FOUND GULLIVER AMONG THE CORN

"Whereupon (says he), the huge creature trod short, and, looking round about him for some time, at last espied me as I lay on the ground. He considered awhile with the caution of one who endeavours to lay hold on a small, dangerous animal in such a manner that it shall not be able either to scratch or bite him. At length he ventured to take me up behind by the middle between his forefinger and thumb, and brought me within three yards of his eyes, that he might behold my shape more perfectly.

"I guessed his meaning, and my good fortune gave me so much presence of mind that I resolved not to struggle in the least, as he held me in the air about sixty feet from the ground, for fear I should slip through his fingers. All I ventured was to raise my eyes towards the sun, and place my hands together in a supplicating posture, and to speak some words in an humble, melancholy tone, suitable to the condition I then was in. For I apprehended every moment that he would dash me against the ground. But my good star would have it that he appeared pleased with my voice and gestures, and began to look upon me as a curiosity, much wondering to hear me pronounce articulate words, although he could not understand them.

GULLIVER IS EXHIBITED AS A CURIOSITY IN BROBDINGNAG

"In the meantime I was not able to forbear groaning and shedding tears, and turning my head towards my sides, letting him know, as well as I could, how cruelly I was hurt by the pressure of his thumb and finger. He seemed to apprehend my meaning, for, lifting up the lappet of his coat, he put me gently into it, and immediately ran along with me to his master, who was a substantial farmer, and the same person I had first seen in the field."

Gulliver was received well in the farmer's family, and made a pet of by the farmer's daughter. Then the farmer was advised to exhibit him for money. Finally, he was sold to the Queen of the land, and had much discourse with the King, when he had mastered the language of the country. A sort of box was made for him by an ingenious carpenter, and this was kept in the palace. All this time the farmer's daughter had charge of him.

After going through many adventures, he was in his box one day when it was caught up by a great bird, and carried out to sea, where it fell in the water. The box was seen by the captain of a ship. Thus it was that Gulliver was released and returned to England in June, 1706.

But here we see the consequences of having grown familiar with people and things totally different from our own countrymen and their ways, for on his way home the littleness of the houses, the trees, the cattle, and the people made him begin to think himself in Lilliput!

HOW GULLIVER FELT WHEN HE GOT HOME AFTER HIS ADVENTURES

"I was afraid of trampling on every traveller I met (he confesses), and often called aloud to have them stand out of the way, so that I had like to have gotten one or two broken heads for my impertinence. When I came to my own house, one of the servants opening the door, I bent down to go in—like a goose under a gate—for fear of striking my head. My wife ran out to embrace me, but I stooped lower than her knees, thinking she could otherwise never reach my mouth. In short, I behaved myself so unaccountably that they all concluded that I had lost my wits. In a little time, I and my family and friends came to a right understanding; but my wife protested that I should never go to sea any more, although my evil destiny so ordered that she had not power to hinder me."

Gulliver in his later travels went to Laputa, a flying island inhabited by philosophers and astronomers, and to the country of the Houyhnhnms, in which horses were the representatives of civilisation, and men, under the name of Yahoos, were degraded beings of the lowest type.

The next stories of books begin on 1493.

THE FROG THAT HELPED THE PRINCESS

THE FROG DIVES DOWN INTO THE WATER AND RESCUES THE PRINCESS'S BALL

THE PRINCESS CARRIED THE FROG TO BED & FOUND TWO LITTLE GOBLINS ON THE PILLOW

THE PRINCESS'S GOLDEN BALL

The Story of the Frog that Became a Prince

CONTINUED FROM 1192

ONE fine evening a young princess went into a wood, and sat down by the side of a cool spring of water. She had a golden ball in her hand, which was her favourite plaything, and she amused herself with tossing it into the air and catching it again as it fell.

After a time she threw it up so high that when she stretched out her hand to catch it the ball bounded away and rolled along upon the ground, till at last it fell into the spring. The princess looked into the spring after her ball, but it was very deep, so deep that she could not see the bottom of it. Then she began to lament her loss, and said:

Alas! if I could only get my ball again, I would give all my fine clothes and jewels, and everything that I have in the world."

Whilst she was speaking a frog put its head out of the water and said:

"Princess, why do you weep so bitterly?"

"Alas!" she said, "what can you do for me, you nasty frog? My golden ball has fallen into the spring."

The frog said:

"I do not want your pearls and jewels and fine clothes; but if you will love me and let me live with you, and eat from your little golden plate, I will bring you your ball again."

"What nonsense this silly frog is talking!" thought the princess. "He can never get out of the well. However, he may be able to get my ball for me, and therefore I will promise him what he asks." So she said to the frog. "Well, if you will bring me my ball, I promise to do all you require."

Then the frog put his head down, and dived deep under the water; and after a little while he came up again with the ball in his mouth, and threw it on the ground.

As soon as the young princess saw her ball, she ran to pick it up, and was so overjoyed to have it in her hand again that she hardly thanked the frog, but ran home with it as fast as she could. The frog called after her:

"Stay, princess, and take me with you as you promised."

But she did not stop to hear a word.

The next day, just as the princess had sat down to dinner, she heard a strange noise, tap-tap, as if somebody was coming up the marble staircase; and very soon afterwards something knocked gently at the door, and said:

"Open the door, my princess dear,
Open the door to thy true love here!
And mind the words that we two have said
By the fountain cool in the greenwood shade."

Then the princess ran to the door and opened it, and there she saw the frog, whom she had quite forgotten. She was terribly frightened, and, shutting the door as fast as she could, came back to her seat. The king, her father, asked her what had frightened her.

"There is a nasty frog," said she, "at the door, who lifted my ball out

of the spring this morning. I promised him that he should live with me here, thinking that he could never get out of the spring; but there he is at the door, and wants to come in!"

While she was speaking the frog knocked again at the door.

The king said to the young princess: "As you have made a promise, you must keep it; so go and let him in."

She did so, and the frog hopped into the room, and came up close to the table.

"Pray lift me upon a chair," said he to the princess, "and let me sit next to you."

As soon as she had done this, the frog said: "Put your plate closer to me, that I may eat out of it."

This she did and when he had eaten as much as he could he said: "Now I am tired. Carry me upstairs, and put me on your little bed."

The princess took him up in her hand and carried him to bed. On the pillow were two little goblins, who vanished as they appeared, so that the princess put the frog upon the pillow of her little bed, where he slept all night long. As soon as it was light he jumped up, hopped downstairs, and went out of the house.

"Now," thought the princess, "he is gone, and I shall be troubled with him no more."

But she was mistaken, for when night came again she heard the same tapping at the door; and when she opened it the frog came in and slept upon her pillow as before till the morning broke; and the third night he did the same.

But when the princess awoke on the following morning she was astonished to see, instead of the frog, a handsome prince, standing at the head of her bed, and gazing on her with the most beautiful eyes that ever were seen.

He told her that he had been enchanted by a wicked fairy, who had changed him into the form of a frog, in which he was to remain till some princess should take him out of the spring and let him sleep upon her bed for three nights.

"You," said the prince, "have broken this cruel charm, and now I have nothing to wish for but that you should go with me into my father's kingdom, where I will marry you, and love you as long as you live."

The young princess, you may be sure, was not long in giving her consent; and as they spoke a splendid carriage drove up, with eight beautiful horses decked with plumes of feathers and golden harness, and behind rode the prince's servant, the faithful Henry, who had bewailed the misfortune of his dear master so long and bitterly that his heart had well-nigh burst.

Then all set out, full of joy, for the prince's kingdom, where they arrived safely, and lived happily for many years.

GOG AND MAGOG

The Two Giant Brothers Who Watch Over London

IN the gallery beneath the western window of the Guildhall of London stand two great giants, whose names are Gog and Magog.

Gog is clothed in a rude fashion, and he carries a morning star, which is a great iron ball covered with spikes, and fastened by a chain to a long pole. Magog, on the other hand, is arrayed like an ancient Roman soldier, and he carries a halbert, which is a kind of battleaxe with a spear at the top.

Gog and Magog are brothers, and the reason why they are dressed and armed in a different way is very curious.

When the ancient Britons came to England the country was peopled by a race of savage giants who lived in dark, damp caves and dressed in the skins of animals. They were very angry when the Britons settled on the banks of the Thames and began to build the city of London.

"What do these men want with houses?" said Gog. "Why don't they live in caves as we do? Let us kill them, and destroy their new city."

"No," said Magog. "Let us make friends with them, and learn how to build, and till and weave. I am sure it is more pleasant to live in a house and wear clothes than it is to live in a cave and wear skins."

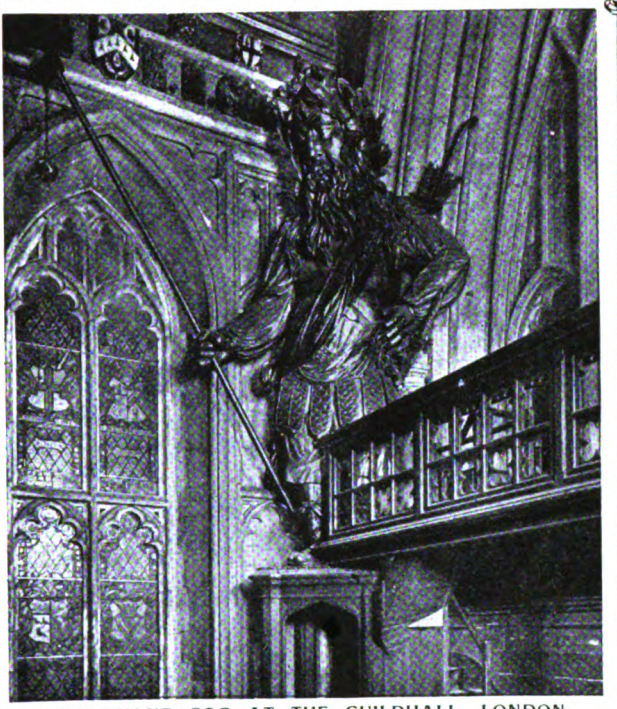
But the other giants would not listen to Magog. They looked on the Britons as intruders and enemies to be driven away or killed. They attacked them and drove them into London, and then they resolved to capture the city the next morning and slay all the inhabitants.

But, on the advice of Magog, the Britons dug a wide, deep trench outside London in the night, and fixed rows and rows of sharp stakes at the bottom of the trench, and covered it with light hurdles. In the morning they went out and fought the giants, and then they pretended to be defeated, and ran back lightly across the hurdles. Their great, clumsy enemies came lumbering after them, and the hurdles gave way, and down fell all the giants into the trench upon the rows and rows of sharp stakes.

Only Gog escaped, and Magog said to him :

"Will you live with me in the Guildhall, or will you fight to the death ?"

"I will fight to the death !" cried Gog ; and, whirling his morning star, he rushed upon his brother. But Magog was armed with a halbert which the Britons had made for his use, and with this he struck Gog down and vanquished him. The Britons lifted up the wounded giant and carried him to the Guildhall, and laid him on a soft feather bed and tended him until he was healed ; and Gog was so touched by their kindness that he resolved to remain with Magog in the Guildhall and guard it from danger.



THE GIANT GOG AT THE GUILDHALL, LONDON

THE GIANT MAGOG AT THE GUILDHALL, LONDON

Now, every Christmas night, when the clock strikes twelve, and the Guildhall is dark and silent, Gog and Magog come out for dinner, and all the rest of the year they stand in the gallery beneath the western window of the Guildhall and watch over the welfare of the people of London.

Some day you may go and see them—two fierce-looking, gigantic, dark, carved figures, one on each side of the window, so tall that you have to strain your neck to look up at them, and many people wonder how they came there.

TALES OF ENGLISH HOLIDAY PLACES

THE FOOL ON THE STOOL AT FOLKESTONE

FOLKESTONE is another of the places which we consider new, for it is only since the railway reached it that the town has become important as a place for holidays. But it was a place of note in the time of the Romans, and "Cæsar's Camp" is among the most interesting spots to-day.

It was important again at a later day, for St. Eanswith founded a great nunnery there in the seventh century. Her father was Eadbald, King of Kent, a fierce heathen king who, before he died, became a Christian. His daughter was a splendid woman, and did much for the good of the land by spreading the blessings of Christianity abroad. The building was destroyed by the Danes, but in 1885, over 1,100 years after her death, the body of St. Eanswith was found in its leaden coffin, and is now buried in the church named after her.

Once when Queen Elizabeth was passing near Folkestone, the mayor of the town went out to greet her on behalf of the people of "Folksteen," as it was called then.

"Most gracious Queen,
Welcome to Folksteen,"

he began, addressing her from a stool. But the Queen stopped him.

"Most gracious fool
Get off that stool,"

she said. That was a rude thing to say to a mayor. But in the old days they did not always treat mayors as mayors liked to be treated.

OLD SCARBOROUGH

AS everyone who goes to Scarborough is aware, there are really two towns. There is the old town, with its steep streets and stairways, its old red-tiled houses where the fishermen live as their ancestors lived hundreds of years ago. Then there is the newer and fashionable Scarborough, where fine roads and great houses make "the English Naples," as it is called, the handsomest seaside town in the North of England.

But even old Scarborough is new compared with the Scarborough whose name is forgotten. The Romans built it, but it was the hardy Norsemen who called it Scarborough. Their word for it was "Scardeburgh," which means a fortress on a rock. Led by Harald Hardrada and Tostig, two daring pirates, they attacked the town in 1066, and because they could not capture it by other means, they set fire to it. They burned all they could, and robbed and murdered right and left. Scarborough was so ruined that, when William the Conqueror had his Domesday Book written, the town was not even mentioned in it.

Later, a great castle was built, and many battles were fought in or near the town. During these dark days, George Fox, the famous Quaker, was imprisoned in the castle. He was shamefully ill-treated. One loaf of bread had to last him three weeks; he had no fire in his cell, and the roof was so leaky that he was compelled to bale out the rain which came through, like a sailor in a half-swamped boat. When the King finally learned that the good Quaker was not a rebel, he released him, but not before Fox had borne great suffering.

Scarborough's mineral springs were discovered by a lady. About a hundred years after they had been discovered, the land round about suddenly sank, the walls of the wells themselves rose up in the air, and the water disappeared. The cliff was cracked and broken in all directions. A great plot of land, with cattle feeding on it, went down seventeen yards, and parts of the broken cliff were forced into the sea. Then things settled down again. There were no more risings or fallings, and the water gradually came back to the wells.

HANGING THE MAYOR AT BODMIN

WHEN Perkin Warbeck had marched his rebel troops through Cornwall, the Mayor of Bodmin, the capital of the county, received a message from the King. The mayor was told to prepare a scaffold on which to hang a man who was supposed to have been connected with the rebellion. The scaffold was prepared.

"Is it strong enough to carry the man?" asked the King's messenger.

"Without doubt it is," was the answer.

"Then up with you, Master Mayor, for it is meant for you!" said the officer.

THE FAIRIES OF THE WILLEY HOW

THE Willey How is a great mound lying between Wold Norton and Bridlington, in Yorkshire. A farmer was returning late at night to Wold Norton, and as he passed the Willey How he heard the sound of singing and merriment. A door was open in the mound, and he walked in and saw lords and ladies sitting at a feast. A serving man poured out a cup of wine, and handed it to the farmer.

Now, if you drink fairy wine you fall into the power of the fairies, and they never allow you to come back to the world of men. The farmer knew this, and he poured the wine on the floor, and rushed out of the Willey How with the cup, and the feasters pursued him. But he got safely away, and gave the fairy cup to the King of England.

THE MERMAID OF LIZARD HEAD

ONE summer evening a Cornish farmer of the name of Lutey was walking by Lizard Head, and he heard a woman crying. On the shore he found a beautiful mermaid, with long golden hair and green eyes, crying because she had got stranded on the rocks, and could not get back to the sea. So Lutey stooped down and took the mermaid in his arms, and carried her to the water. On the way she talked to him so sweetly that he was about to dive into the sea with her, when his dog barked behind him. He turned and saw the smoke rising from the chimney of his farm, and the madness left him.

"Farewell, my sweet, for nine years," said the mermaid, as she swam away.

And nine years afterwards Lutey was out fishing in a boat, and though the weather was calm a great wave bore the mermaid over to the boat.

"My time has come," said Lutey. He plunged into the sea, swam a little way with the mermaid, and sank down with her, never to rise again.

ROBIN ROUND CAP WELL

THERE was a farmer in Holderness whose house was haunted by a little elf called Robin Round Cap. It plagued the poor farmer nearly out of his life, and one day he put all his furniture and goods on a cart, and set out to find a quieter place to live in. As he drove down the road he met a friend, who said: "Hallo! Are you moving, then?"

And before the farmer could reply a voice from the cart said "Yes."

And there was Robin Round Cap, sitting on one of the chairs. The farmer saw he would gain nothing by leaving his farm, so he returned, and got a wise man to entice Robin Round Cap into a closed-up well by his house, now called Robin Round Cap Well. There the mischievous little imp is still imprisoned.

THE SNAKE'S PARLOUR

IN the old days women used to do their washing in a very pleasant fashion. They assembled together and took their linen to a running stream, and there they scrubbed and gossiped merrily in the open air. Some women were once doing their washing in this manner by a rocky pool in the River Wye, when a girl saw a great, deadly snake glide out from the stones. On reaching one of the rocks the snake put something behind it and went away, and the girl crept up to see what it had hidden.

Finding there the poison fangs of the snake, in the shape of two little horns, she ran off with them. When the snake returned, it searched vainly behind the rock, and began to hiss and rage. It hissed louder and louder, and lashed its tail, and then, seeing nothing else to attack, it reared up and began to fight the rock. In its fury it struck the stone so hard with its head that it broke its skull and died. And the women were delighted to see that the deadly thing had killed itself, and that they could now do their washing in peace and safety.

THE GOBLIN BUILDERS OF ROCHDALE

IN the reign of William the Conqueror, Jamel the Saxon resolved to build a church to St. Chadde on the bank of the River Roach. Piles of timber and stones were brought, and the foundations were laid; but during the night the goblins, striding twenty paces at a step, carried the stones and timber to the hill-top over the river. In the morning the people set to work to bring the stones and timber back, ready to lay the foundations once more, but when the time came to begin the things had disappeared, and were again found on the hill. Thinking it useless to build by the river bank, they built the church on the hill, where it now stands, with one hundred and twenty-four steps up to it.

EARL'S DAUGHTER AND BEGGARMAN

How Guy of Warwick Went Out into the World & Came Home Again

In the early days of Britain the favourite attendant of Rohand, the Earl of Warwick, was very ill. The doctors had given him all the valuable herbs they could think of, but still he wasted and pined away.

At last he murmured very faintly:

"Felice! If Felice were brought to me, I yet might live."

The doctors, bending down, caught the words faintly, and said one to the other: "Felice? Felix? There is no such herb." And the poor boy answered: "No herb is Felice, but a flower —the fairest flower that grows."

The boy's name was Guy, and the name he murmured was the name of the great earl's beautiful daughter.

One day, when he was better and was able to move about the garden, he saw Felice approaching. She had heard that Guy was dying of love for her, and she had had a strange dream, in which Heaven declared that the life of this poor page was a precious one. So she spoke kind, strong words to him.

"Why kneel there weeping like a girl? Get up, and show if there is the making of a man in you! The swan mates not with the swallow, and I will never wed beneath me. Show yourself my peer. For I could love a brave and valiant knight before whose spear man bowed as to a king, nor would I ask his parentage; prouder far to know that my children took their nobility from a self-made nobleman. But a weeping, love-sick page! No! Show me something that you do that I can love."

Her words filled the heart of the page with a strange and glorious strength. His eyes shone, his voice rang clear. He told the beautiful girl that love for her should make him the greatest knight in the world. And Felice answered:

"I will watch and wait."

Then Guy got speedily well of his sickness, and the great Earl of Warwick, rejoicing in his favourite's recovery, dubbed him a knight, and provided him with a proud horse royally caparisoned, with rich armour, with spear and sword and shield. Thus accoutred the bright-faced boy rode away from Warwick to do great deeds, and make a name for himself. He travelled into strange lands, crossing many stormy seas, and scarcely a day passed but he was in the midst of some fierce and terrible adventure, which almost passed one's powers to believe. As the years fled away his fame increased, till the whole world seemed to be full of the deeds of Sir Guy.

After many adventures, and covered with glory, he returned to Warwick, and, presenting himself before Felice, asked her if he had yet won her love.

But Felice answered in strange voice. Yes, he had won her love; he had done great deeds; he was, in all men's eyes, the bravest knight in Christendom; yet would she not marry him. And this was her reason. Marriage would put an end to his glory. He was too young yet to turn away from joustings and tournaments; he must seek glory in his youth, and only when his arms began to weaken take his ease in the idleness of a lady's love. Glory, glory! More and ever more glory!

So Guy rode away once more, and once again the earth rang with his deeds. He defended the weak; he punished tyrants; he overthrew the cruel. Then he returned again, and this time Felice yielded to him, and the most beautiful maiden in Britain was married to the most valiant knight in Christendom.

But now a strange thing happened.

They had been married, this happy pair, forty days. It seemed as if for ever after life must be to them one long and beautiful summer festival of love and happiness. But it chanced that Sir Guy, sitting one sunset at a window in his tower, began to meditate upon his past life in foreign lands. He had killed many men; he had taken many kingdoms; he had laid waste many lands. Why? Why had he fought and killed and striven? Why? *For a woman's love!* The thought shocked him. All his life he had been seeking earthly glory for the sake of a woman's love. Not once, not once in all his crowded life, had he done a single deed purely for God.

He rose up, determined to serve his God. Felice clung to him with tears. She who had sent him forth on perilous quests now cried to him not to leave her. But Sir Guy would not listen. "Not yet one single deed for God

above!" was his lament. And he clad himself in a palmer's dress, and, with a gold ring of his wife's upon his hand, set out on a pilgrimage of penance to the Holy Land.

Once more did adventures, many and great, fall to Sir Guy, even in his pilgrim's dress; but he let no man know that it was the terrible Guy of Warwick, letting them think that the power of God was made manifest in a poor pilgrim. Afterwards, humble in heart and at peace with God, still wearing his pilgrim's dress, he returned to Warwick.

He was so changed in appearance that no one knew him; and when he humbly presented himself at his own door, begging for alms, he was received by his own wife as no more than an ordinary pilgrim, and entertained by her unawares. Sir Guy was more amazed to find that the proud and beautiful Felice welcomed him with a sweet and gracious humility, that she insisted on bathing his feet herself, and waiting upon him as he sat at table. Then he learned that, because her own husband was a pilgrim in the Holy Land, this great lady, ever since the hour of his departure, had spent all her days in doing human kindnesses. How sweetly she spoke of Sir Guy; how tenderly she listened to the poor; how graciously she comforted the sad and sorrowful; how lovingly she gave herself to the pleasure of children at her gate!

Then thought Sir Guy: "She is serving God. Who am I to come between her and God? I will go away."

Yet so great was his love for her that he could not bear to go very far from her dwelling. So he betook himself to a hermit's cell near by, and there for many years, in fasting and prayer, devoted all his thoughts to the great God who had made the heavens and the earth, and delighted his eyes in beholding the pure and holy life of his Felice from afar off. At last, grown old and grey, and feeling himself to be dying, he sent the ring of Felice to the castle by a herdsman, bidding him give it to the Lady Felice herself.

In the old days, when men gave up their lives to some great cause and went out into the world doing noble deeds, they would vow before the sacred altar to be true and faithful. This famous picture, painted by John Pettie, R.A., shows a brave knight's vigil all night at the altar, taking a vow to live nobly and right.

"Where got you this token?" cried Felice, very white.

"From a poor beggarman that lives in yonder cell," answered the herdsman.

"A beggarman! Nay! From a kingly man!" cried Felice. "He who gave you this ring is Guy of Warwick, he and no other!"

Then swiftly she flew to the hermit's cell, and lovingly she took the dying pilgrim in her arms, and softly they wept together. Husband and wife were united at last. Close to each other they clung, and happy were their hearts in the higher love which consecrates all mortal affection. And, under the roof of a hermit's cell, the splendid soul of Guy of Warwick rose to his God.

THE FIRE GOBLINS

A TALE OF THE LONG AGO FOR A WINTER'S NIGHT

MANY years ago the world was full of curious little people, called fairies and goblins.

The fairies danced in the fields on moonlight nights. They never did any harm, and often helped people in trouble, and were especially kind and good to children. They cared for little wounded creatures in the woods, mended the broken wings of birds and insects, and lifted the heads of the flowers when heavy storms had dashed them to the ground. The goblins lived inside the hill-tops, and worked underground, where they dug great caverns. They seemed to take pleasure in playing ill-natured tricks on anyone who wandered alone on the hills after sunset, teasing any small and helpless thing they might find, and they were always greedy and selfish.

They spent all their time gathering sunbeams on the mountains, and carried them down into the caverns, where they stored them for dark and sunless days. When a goblin had filled a cavern he would lie down to sleep in it, and his sleep would last as long as the sunbeams were left undisturbed. Sometimes they would steal little boys, and carry them underground, where they made them press down and pile together the sunbeams. These children were never allowed to go above ground lest they should tell of the wonders they had seen. They soon forgot all about their old life, and, after they had fed on goblin food seven years, became goblins too. In those days men and women who lived in the world were often very cold, when the sun did not shine, for they had no fires to warm them as we have.

Now, there lived in the wild forests of a great country a boy named Hephtus, who was not strong and well like most children, and he would often creep out into the sunshine, and lie there. The sunlight was his playfellow and friend, and when the winter came he would try to think of how he could lay up a store of sunshine as the squirrel laid up nuts. One spring day Hephtus was in the wood, puzzling over his plan, when, looking up, he saw a tiny fairy slide down a streak of sunlight to his feet. She had a crown on her head that sent out light like the rays of a star; her eyes were like the sky when the moon is very bright; her hair hung like soft, white moon-clouds around her; and her dress was sunset colour.

"I am the fairy Ignis," she said, as Hephtus stood trembling, afraid to move lest she should disappear. "I know all about you, and I have some work for you to do. Will you do it?"

"I am so weak and useless," he answered timidly. "There are a great many boys much stronger than I am; still, I will try very hard, Fairy Ignis, if you will let me."

"That's all I want," the fairy replied. "*You* are the boy I need, not the strongest, nor the best runner, but one who cares about things and tries to understand them. You love the sunshine. Will you go and bring sunbeams to men? These sunbeams lie buried in the earth, and I will tea h you how to find them."

"Thank you!" he cried, springing towards her in his delight. "Tell me how."

"Listen, then! You must go alone on to the mountains where the goblins live, and they will carry you down to their caverns below. There they will chain you to the walls, and make you work day and night. Now, remember, you must not eat the food they give you. Take this phial, and when you are hungry swallow a few drops. I shall watch over you, and when you have seen and learnt all you can I will help you to escape. You will be a man when you come back. Will you live ten years down there to help me?"

Hephtus looked at the sunlight; he heard the birds singing again after the winter; a little rabbit frollicked close by; and a squirrel, tempted by the sunshine, had come out to nibble some fresh young shoots. He would see none of these things. Then he looked again at the fairy.

"I will do what you tell me," he said, "if you will help me."

"Lose no time," she answered, giving him a small bottle. The next minute he found himself alone at the foot of a mountain. While climbing he saw goblins darting about catching sunbeams, but he went bravely on, until he was surrounded, taken prisoner, and carried into darkness.

HEPHTUS MEETS THE FAIRY IN THE WOOD

"I AM THE FAIRY IGNIS," SHE SAID, AS HEPHTUS STOOD TREMBLING AND AFRAID TO MOVE.

Here he was set to work day and night, chained and watched at first, but careful never to eat the enchanted food they gave him. Sometimes he was unchained and allowed to wander alone through the long passages. They ran in every direction from a large central hall, and opened out on all sides into caverns, some newly hollowed, some half filled, and some closed up, where the tired fire goblins, having finished their work, had buried themselves.

At last his master came to him one day, and said: "Hephtus, you have worked well lately, and earned your reward; before long I shall have mine. For fifty years I have laboured fitting up my sleeping chamber, and I shall rest in it when the winter comes. When you have sealed up my cavern, carry the key to the central hall on the night when they hold their yearly feast, and lay it before the king, saying, 'My master bids me claim my reward.' Then the king will give you a goblet of rich goblin wine to drink, and confer on you the rights of goblinship, to choose and hold a cavern of your own, and the goblin power of catching sunbeams and changing them into crystals. He will also give you a proper dress to wear. This is all you need, and all I can do for you. Promise me that you will wrap me comfortably up and close my cavern tight."

"I promise," answered Hephtus; and soon after, when the fairy came to see him, she said: "Will you take my message to the earth people? Remember, they won't believe what you tell them; they will mock at you and ill-treat you. That is what they do to anyone who dares to try and teach them; and even when they have your gift you will find no gratitude, and get no thanks. Will you still go?" "I will go," he answered.

So the winter came; and Hephtus tucked his goblin master cosily up in his bed, and knew that he would be free as soon as he had given up the key of the cavern to the goblin king. He stood outside the goblins' hall, and heard the shouts of laughter and feasting.

"Come with me, and dance," cried a little brown-haired girl.

"I'm late to-night," he said, keeping in the shadow. "I'm not ready yet; but when I come I'll dance with you. Only take this key for me to the king."

The girl took the key and hurried away; while Hephtus, for the first time, felt sorry he had given his promise to the fairy. As he stood hesitating, his hand touched the fairy bottle he carried, and, taking out the cork, he swallowed a few drops, then turned and ran along the dark passages that led up above, shutting his ears to the tempting sounds, and thinking of the message he had to take to the earth people.

At last he found himself outside on the mountain, and, overcome with the light, he threw himself down on the ground. When he dared to open his eyes again, he saw that it was a beautiful summer's morning.

As he went through the villages, the children shouted after him because of his strange dress and his long hair; even the men said he was mad, and would not listen to him. At last he came to the palace of the king. The king's councillors tried to drive him away; but the king was good and wise, and listened to all that Hephtus said. When Hephtus had told him all, he said:

"I will go with you, and see if what you say is true. A hundred soldiers shall come, and a hundred men with pickaxes; and you shall show them where to dig, and if you have spoken falsely you shall die."

"I am content," answered Hephtus, with a deep sigh. So the king and Hephtus, and all the soldiers, with the men the king had chosen, came to the mountains, and there the king waited many months while they dug deep down into the earth. And when they had found the coal, Hephtus showed them how to build cages, and how to make the fierce little goblins work.

And the goblins still make beautiful caverns inside their cages. You can see them if you look through the bars of the grate; and when the caverns are red and hot they go to sleep. If you put your finger on the bars of their cage, the goblins will often bite you; but they are very pretty, and tempt little children to play with them.

But the goblins are dreadfully afraid of water, and if you throw some water into their cage they will spit and hiss at you as they die, for water kills them. But they are useful, and grown-ups can keep them in order. If they are lazy, we wake them up with the poker.

The next stories begin on page 1433.

A BRAVE LITTLE QUAKERESS

It was late afternoon of the 2nd of December, 1777. A light snow was sifting down upon the streets of Philadelphia, covering the pavements and houses with a frosting of white.

In one house on Second Street, a woman, her tranquil face framed in a Quaker cap, sat at the window. The knitting had dropped into her lap and her hands lay idle. She sighed once or twice as her eyes rested upon the red-coated sentinel who marched up and down in the gathering dusk before the house across the street. The British were in possession of the town and the house opposite had become the headquarters of General Howe. Presently she saw the door of the house open and an officer came out. The woman could hear the faint click of the musket as the sentinel saluted. The officer hurried across the street and before the woman realised it, he was knocking at her door. She hastened to let him in.

"Can I do anything for thee?" she inquired. Her placid, even voice did not betray the agitation that she felt. The officer was the adjutant-general of the British army.

"I should like to use your room upstairs for a private meeting of some of my officers to-night," said the officer. Then as he was departing he added emphatically, "And be sure, Friend Lydia, your family are all in bed at an early hour. When my guests are ready to leave the house, I shall myself awaken you that you may let us out and extinguish the fire."

Lydia at once set about putting all things in readiness before her husband should return home for dinner. As she hurried busily to and fro her mind was keeping pace with her hands and feet. An indefinable feeling of uneasiness took possession of her. The British officers had met several times before at her house but to-night she could not shake off the presentiment that something of great importance was to take place.

Immediately after dinner, Lydia hurried her family to bed as soon as she could. Presently she heard a loud knocking at the front door. With a candle in her hand she slipped downstairs and let in the British officers.

Then she went to her own room and threw herself without undressing upon the bed. She tried to sleep, but all her uneasy fears of the afternoon came thronging back through her mind. What could those British officers be planning? Surely no good for the army of her own dear land. She lay there, her eyes staring into the darkness, her fingers clasping and unclasping each other in a spasm of nervousness. Presently she could bear it no longer. She sat up on the bed and feverishly unfastened her shoes and slipped them from her feet. Noiselessly she stole out of her room down the hall. For a moment she paused uncertainly by the door behind which the British officers were closeted. She could hear the murmur of eager voices. Then she caught a word that sent the hot blood pulsing into her cheeks. All her hesitation was swept away. She leaned forward and pressed her ear to the keyhole. A voice was reading a paper aloud. It was an order for the British troops to make a secret, night attack upon the American army encamped at White Marsh.

Lydia had heard enough. She fled down the hallway to her room and creeping into bed she tried to still the beating of her heart and to think. A few minutes later someone rapped loudly upon her door. Lydia

paid no heed. It was as well for the officer to think that she was asleep. The knock came again, but still Lydia did not stir. Again it was repeated. This time with unmistakable loudness and impatience. Lydia rose quickly and opened the door. As she had expected, it was the adjutant-general, who had come to notify her that they were going. When the officers had left, Lydia returned to her room and to bed. But sleep was a stranger to her that night. Restlessly she tossed to and fro. She must save her fellow countrymen from the danger that threatened them, but how? How? If she told her husband and asked him to help her, that would place him in special peril as the sharer of her secret. No, no, — she would bear the risk alone.

"O Father in Heaven!" she prayed, "Guide thy servant in this, her hour of need." Presently her resolution was formed. She could not sleep, but now she could wait quietly for the coming of the day. She knew what she would do on the morrow.

She spoke to her husband at breakfast about the subject that was uppermost in her thoughts.

"John, if thee would not mind, I should like to go to Frankfort to-day to get some flour for our household."

"Certainly, Lydia," replied her husband tranquilly, "but thee must take the servant with thee to carry thy bag."

"Nay, I will go alone, for I cannot spare the maid from the house to-day. There is much work to do."

"Well, well, do as thee likes best," replied John indulgently as he departed on his business.

Lydia at once hurried over to the British headquarters to secure a written permission to pass through the British lines. Then with her bag under her arm, the demure little Quakeress set out through the snow to Frankfort, about five miles distant. There she left her bag at the mill, and slipping unnoticed from the town, she hurried in the direction of the outposts of the American army almost at a run. She knew that she carried her life in her hands for if the British learned of her errand, they would show her no mercy. Breathlessly, she pressed along the snow whitened road. Suddenly there came to her ear the steady beat of an approaching body of horsemen. The woman stopped, her hand pressed against her aching side, her heart choking into her throat. Suppose it were the British. Then she gave a little sob of relief. "Thank God!" she whispered, "Thank God!" The approaching horsemen wore the blue uniform of the American cavalry. It was a very quiet and composed little Quakeress before whom the cavalry officer dismounted and took off his hat.

"I would speak with thee, alone," she announced gravely.

"Very well, madam," he returned courteously. "Ride ahead, men. I will join you presently," he commanded. Then quietly and unhurriedly, Lydia disclosed her secret.

"I would ask thee not to betray to anyone whatsoever to whom thou owest the knowledge of this matter," she added when she had finished.

"I cannot thank you enough, madam, for the service you have done us," said the officer gratefully, "and you may rest assured that no one will ever learn from me the source of my information. Pray let me conduct you to a house nearby where you can rest and get something to eat before you return to town."

"No, I thank thee, friend," returned Lydia, "I must return with all haste or perchance someone may miss me and suspect my errand."

With a light heart, the brave little woman pursued her way homeward, carrying the bag of flour which had been the supposed reason for her visit to Frankfort. She had tried her best to save the American army, yet she was not wholly free from fear as to the results.

Two days later, a thunderous knocking on the front door of her home brought Lydia's heart into her mouth. She knew that the crisis had come. With a silent prayer on her lips she obeyed the summons.

A British officer stood before her. His face was dark and relentlessly

stern. He locked the door behind him and motioned Lydia to a seat.

"Were any of your family up, Lydia, on the night when I received company in this house?"

"No," answered Lydia, truthfully; "They all retired at eight o'clock."

"That is strange," growled the officer. He gnawed his moustache, frowned to himself, muttering,—"Very strange! Very strange! She was asleep, I know, for I knocked three times at her door before she heard me." Aloud, he went on to Lydia, his keen eyes searching her placid face for a sign of betrayal:

"I am altogether at a loss to conceive who could have given the information of our intended attack to General Washington. When we arrived near his encampment we found his cannon mounted, his troops under arms, prepared at every point to receive us. We had to march back like a d—— parcel of fools!"

"I sent the family to bed at eight o'clock," Lydia repeated in her even voice. "I do not believe any of them were up after that hour." The officer looked at the straight little figure standing before him for a minute, then he strode out of the house, clanging the door behind him.

When the resounding footsteps had died away, the small, gray figure slipped to its knees, face buried in hands. "Thank God," Lydia sobbed, "Thank God for a merciful deliverance!"

POCAHONTAS

A WHITE man squatted alone on the floor of an Indian wigwam. His bearded face rested in his hands and every now and then he scowled thoughtfully into the gathering gloom of the evening as he restlessly gnawed his moustache. The sound of guttural mutterings and of leaves scuffling under soft shod feet drifted in through the openings of the wigwam. The white man threw back his sturdy shoulders impatiently.

"If I am to be roasted and eaten, I might as well know it," he growled, "I am sick unto death of this delay."

Before the words were off his lips, the flap of the wigwam was pushed softly aside and an Indian warrior, hideously bedaubed with red and blue paint, slipped through the opening and stood before him.

"Let the White Father make ready to go to the emperor, the great Powhatan," the Indian announced impressively.

"I have been ready this long while," returned the prisoner shortly.

"The White Father must come with me." The Indian made a motion as if he would lay hold of the white man's arm. The prisoner stepped back.

"Keep your hands off me," he said harshly. "Lead on and I will follow," he added imperiously.

The Indian gave him a quick glance and the glance held hatred. He could not understand all the white man's words, but he had caught the tone of contempt and loathing. He turned on his heel abruptly and strode out of the wigwam.

The prisoner followed. For a moment a glare of light blinded his eyes. Then gradually he made out the scene into which he had been ushered. A great council fire blazed against the shadowy background of the forest. In the fitful light of the leaping flames, the prisoner could make out the forms of two hundred or more Indian warriors, all fantastically bedecked with paint and feathers like his guide. In the centre of the council a throne-like platform had been raised, and on the platform was seated Powhatan, the warrior chieftain, a robe of raccoon skins flung across his bronzed shoulders, his head decorated with the white feather head-dress of a chief.

The appearance of the prisoner was the signal for a blood curdling yell that came weirdly echoing back from the shadowy forests. He was conducted before the throne of Powhatan. In the solemn silence that had settled down upon the council, one Indian woman tendered him a bowl of water to wash his hands, while another

handed him a bunch of feathers with which to dry them.

After the ceremony of washing, an abundance of all kinds of food, cooked in the Indian fashion, was placed before the prisoner. Although naturally far from hungry, he forced himself to partake freely of the messes placed before him, while he coolly ran his eyes over the dusky throng gathered about, searching in vain for some friendly glance. Dark looks of hatred and distrust met him on every side. Suddenly his eyes met those of a little Indian maiden who was seated on the left of Chief Powhatan. He let his glance rest in hers for one brief moment only and then composedly went on in his inspection of the dusky, moving figures. But his heart beat faster. Could it be possible that he had read a message of sympathy in that quick, dark glance? Without seeming to do so he inspected the girl. She was little more than a child after all. The man guessed that she could not be more than twelve or fourteen years old. He reflected that Indian girls developed into womanhood very early.

At last the tiresome ceremony was over. There was a long consultation between Chief Powhatan and his warriors, which came to an end with a startling, ominous whoop. The prisoner's heart sank heavily as he tried to read his fate in the stolid, expressionless faces of the Indian braves. However, from the signs that passed between them, he knew that he was to suffer death. Two large stones were rolled before Powhatan. The prisoner watched the proceedings with stern calmness. He knew what was to follow.

Suddenly the Indians nearest to him laid hold of his arms and dragged him to the spot. With eager, savage fingers they forced him to his knees and pressed his head down upon the stone block. A warrior stepped forward with a huge club. They were going to beat out his brains. The savage waited with upraised arm for Powhatan's signal. The prisoner closed his eyes and snapped his teeth firmly on his lower lip. He would show these savages that a white man could die as stoically as any Indian brave. The awful, waiting hush was broken by a sudden, piercing shriek. The man with his head on the block opened his eyes — startled. A slim, dusky figure flashed from Powhatan's side. Two brown arms were thrown about the white man's neck. Then a shout of wonder broke from the savage multitude.

"Pocahontas!"

It was the idolised daughter of their mighty chief who had placed her head between the White Chief and the executioner's club.

"No! No! Slay him not! He shall not die!" The girl was crying in her mellow Indian tongue.

The Indian executioner, confused and abashed, let his uplifted club fall slowly to the ground. He dared not strike, or the blow would fall on the head of the darling of their tribe. Before he had time to gather his thoughts, Pocahontas arose and darting to her father's side, threw her arms about him. Brokenly, with the tears streaming down her cheeks, she pleaded for the white man's life, pleaded with the stern old chief who showed mercy to no man. The girl spoke with an eloquence and passion that moved the multitude of crowding savages. Suddenly exhausted, Pocahontas slipped to the ground and hid her face against the chieftain's knees, choking. A shout of sympathy rent the crowd. Powhatan raised his hand with a silencing gesture.

"Let the White Chief go," he said slowly.

Again a wild shout went up from the multitude, and this time it was a shout of delight. Pocahontas had completely won them to her cause. The white man's life was saved. A few days later the prisoner, whose name was Captain John Smith, returned to Jamestown and his own people, and in his heart he bore with him a lifelong gratitude to a little, dusky Indian maiden — Pocahontas.

THE GRASS OF THE FIELD

CONTINUED FROM 1177

GRASS is one of the commonest of all things. It is also a thing of beauty and wonder; but it is so common that we seldom pause to admire its beauty or to think of the wonder of its structure and habits. We ought to do all this, for grass is one of the most important things that exist on this earth. It is almost as needful to us as air and water. Many millions of people in the Far East live chiefly on the seeds of a grass called rice; and even in this country we should do ill without grasses, for our bread and cakes are made from the powdered seeds of a grass called wheat.

It is true that we do not eat the common green grass of the fields, but sheep and cattle do; and but for the grass we should have neither beef nor mutton—neither milk, nor butter, nor cheese. Although we treat it roughly, even treading it under our feet, the grass is worth more to us than all the lilies and roses in our gardens.

Wherever there is a little patch of bare earth, whether in town or country, it will not be left long before grass springs up, and covers it with a green carpet. It is always striving to fill up the beds and borders of the garden; and if the roadman did not take care, the grasses would spread from the fields and cover the roads. There are over 3,000 kinds growing in different parts of the world, and over a hundred kinds in this country.

If you were walking through a meadow of tall, flowering grasses just before the reapers come to cut it for hay, and if you were to gather as many kinds as you could see, you would be surprised at their number. In the spring you may have walked through the same meadow, and, looking around, you might have said that there is only one sort of grass; but you could not say that when the tall flowering stems sway in the breeze.

At first the grass sends up only its long, narrow leaves, which are rolled up lengthwise, so that they can push their way between the broader leaves of any other plants that may be growing there, and so reach up to the light. Many of them have underground shoots, which are quite as sharply pointed, to enable them to force their way, however closely the earth may be crowded by the roots of bigger plants. And so they spread on all sides. The leaves may be eaten off by cattle or mowed down by man, but the grass-plant is not hurt, as other plants would be.

In summer it sends up its jointed, tubular stem, which is wrapped around by the lower half of each leaf, and the other half spreads out widely to catch the air and sunshine for its food. At the top of the stem the brush of flower-buds appears, and as it opens the flowers in smaller clusters spread widely on hair-like branches. They are so well-balanced, and the slender stem is so

perfectly formed, that it is seldom one gets broken down by the wind, though if we walk through the long grass in the hayfield, we do much damage to it.

It is not easy to describe the flowers of the grasses. They are so different from the flowers of the garden that we do not talk of their sepals and petals, for they have none. Instead, they have a number of stiff, chaff-like scales to protect the stamens and pistil. These scales, when found wrapped around a grass seed or a grain of wheat, you would call husks, but in flower-books they are spoken of as "glumes" and "paleæ."

Let us suppose that you have gone into the field and found a stem of the sweet-scented vernal grass, which you will know by comparing it with the photograph on page 1342. This is quite a common kind of grass, and the one which gives the delightful fragrance to new-mown hay. Its flower-spike is one of the simplest, and you will have little trouble in getting one flower apart from the others. Let us have a sheet of note-paper laid on the table before we begin, and as we pull off each scale, we will lay it on the paper in the order in which it stood on the flower. The pistil ends in two long, hairy branches, and these will enable us to see that we are picking off only one flower.

The outer scale is larger than any of the others, and the next one is not much smaller. These two are known as the outer glumes. Next come two which are hairy, divided at the tip, and have a long, stiff bristle standing out behind the notch. These are known as the barren glumes, and the bristles are called awns. That makes four. The fifth is the flowering glume, and the sixth is the pale—smallest of all. These have blunt points; they are not notched, and they have no awns.

There now stand revealed to us two stamens, and in between these stands the fat little pistil, ending in the two long, hairy branches or stigmas. The stamens consist each of a long, slender stalk, on which is delicately balanced the large anther, which bursts and scatters the pollen powder on the breeze. Different kinds of grass differ slightly in the size and shape of these parts and in the way the flowers are arranged; but if you learn these details of one kind, you will have little trouble in understanding the others. In most kinds you will find there are three stamens, but in vernal grass two only.

The anthers hang out below the stigmas, and are so lightly poised that the softest breath of air shakes them, and away goes the pollen to get caught on the hairy stigmas of a flower-spike a little further down the field. The stigmas of a grass-flower are not ripe until the flower's pollen has been scattered. The fat pistil gets hard after the stigmas have caught some flying pollen-grains from another flower, and inside of it there is found, a little later, a ripe seed. The stigmas are hairy, so that they can easily catch the pollen as it blows along. At the time the grasses are in flower there is so much of this pollen floating in the air that we draw it in as we breathe, and some people who have delicate nostrils and throats suffer from hay-fever because of the irritation the dust-like pollen sets up.

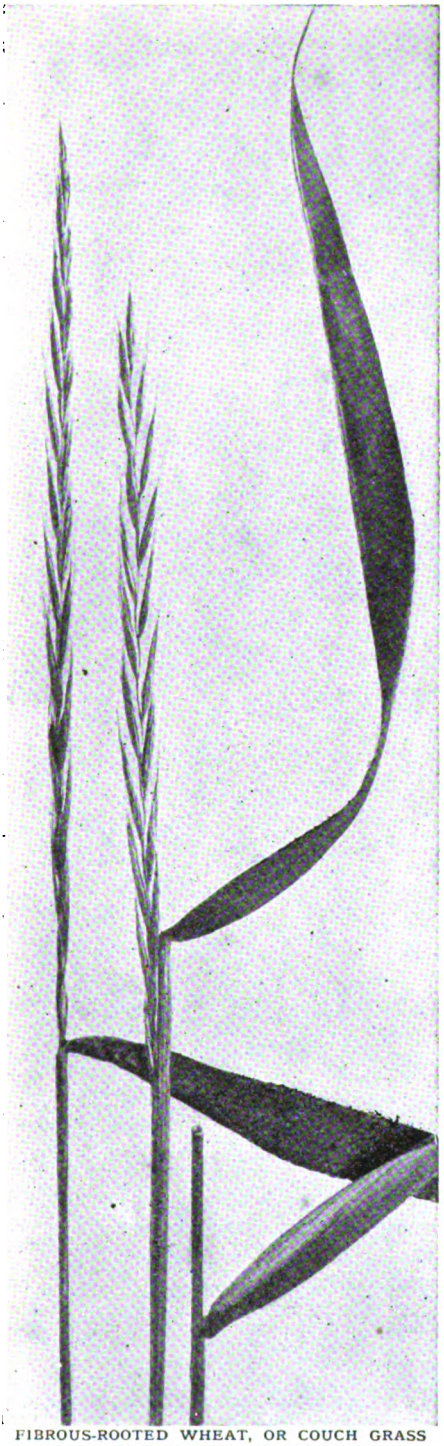
The awns on the inner glumes are believed to prevent the seeds being eaten by birds and other animals, their sharp points pricking the lips or tongues. In some cases also they assist the grasses to spread from place to place by sticking the seeds to the fur and feathers of the wild creatures. If you have been playing in the hayfield, you will find scores of them sticking in your clothes.

The stems of the grasses are made up of jointed lengths. The joints are swollen and solid, but between them the round stems are nearly always hollow. Their outer skin is made up of a coating of very thin flint, which makes them so strong to bear the flowering branches without breaking in the wind. If you look at a bamboo cane, you will understand the structure of the smaller grass-stems—for bamboo is only a giant grass.

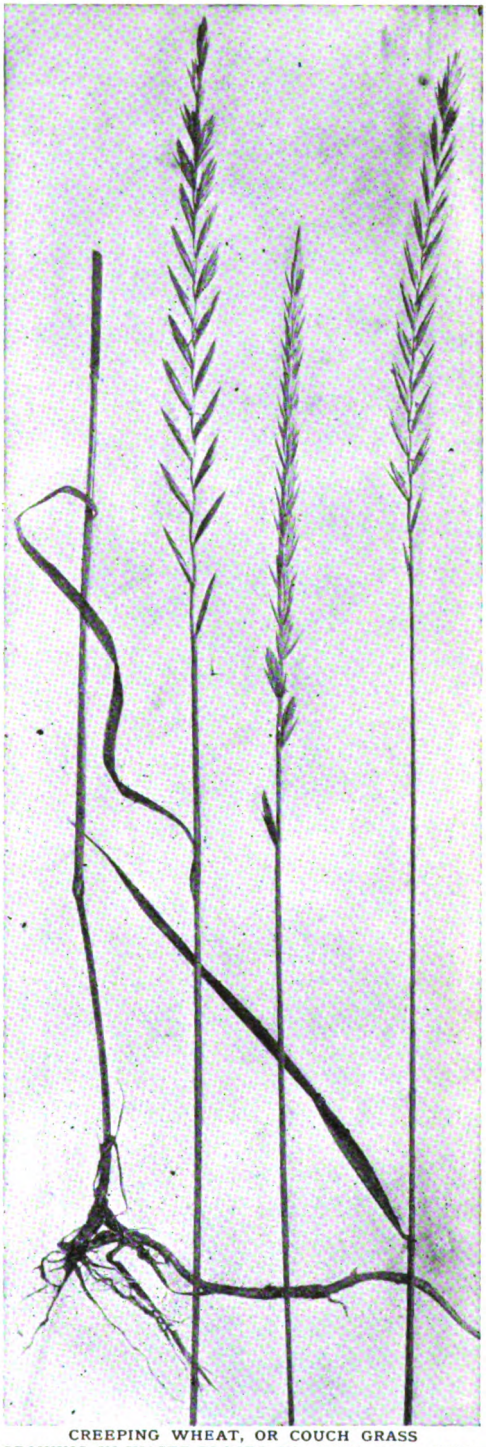
The leaves of grass sometimes have their edges set with fine teeth, so fine that we need a magnifying-glass to see them; but if you draw the grass-blade between your fingers these teeth will cut you as badly as a sharp razor would. The hundreds of millions of grass-blades in a field are always giving out oxygen to purify the air, and when any moist air passes over them, their smooth, cold surfaces cause it to condense, and so keep the earth moist and fruitful.

The photographs in the following pages show us some familiar grasses.

THE MOST FAMILIAR WILD GRASSES

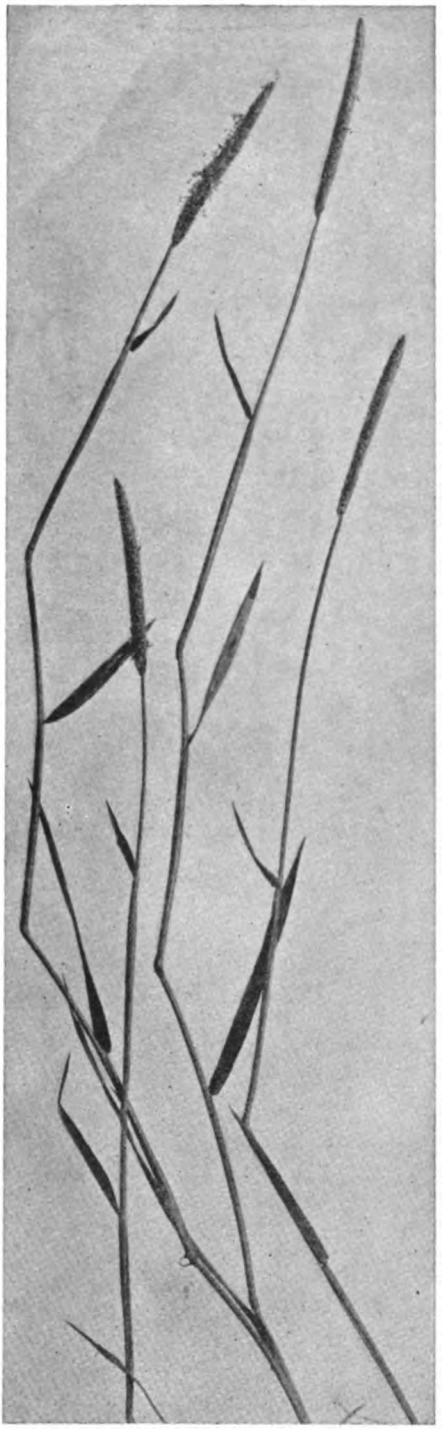


FIBROUS-ROOTED WHEAT, OR COUCH GRASS
GROWING IN WOODS, IN JULY

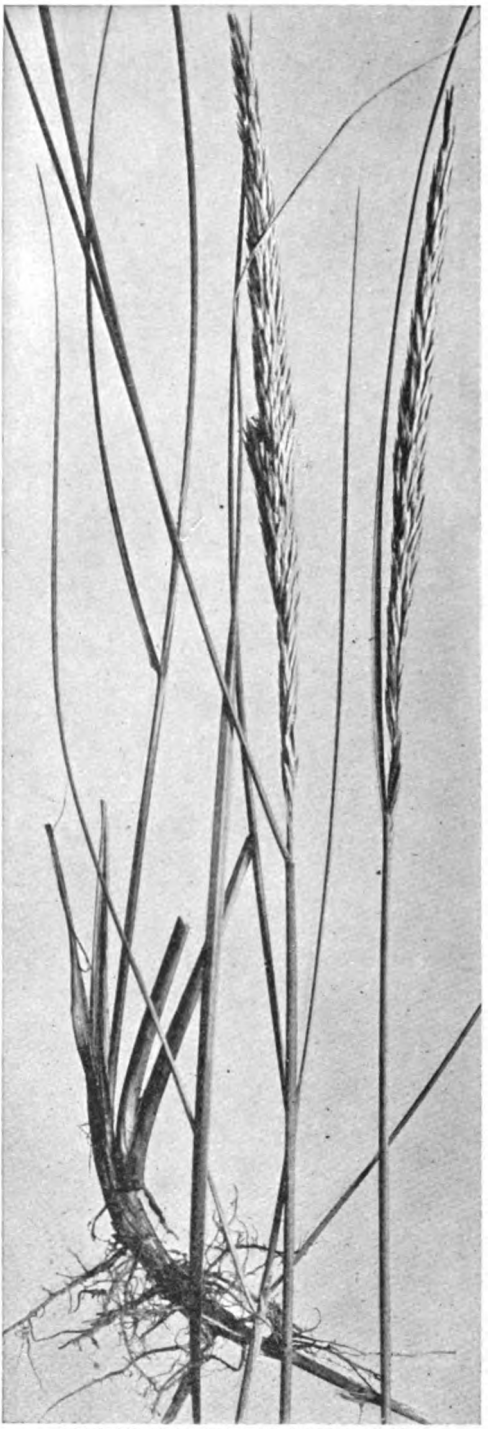


CREEPING WHEAT, OR COUCH GRASS
GROWING IN WASTE PLACES, IN JUNE AND JULY.

Though we may find couch grass in the woods, it is no use to look for it in the same place year after year, for, if left to itself, it soon dies down. Sometimes it is called "spear grass." The picture shows why.



FLOATING FOXTAIL
GROWING IN MARSHY PLACES, FROM JUNE



COMMON SEA-REED, OR BEACH GRASS
GROWING IN LOOSE SAND BY THE SEA, ABOUT JULY

Floating foxtail is a kind of brother of meadow foxtail; but it is not useful, merely curious, because it grows wild in such very wet places. The sea-reed is very useful because it prevents the storms from washing the sands in which it grows away, and thus prevents the sea from encroaching upon the land.

YELLOW OAT GRASS
GROWING IN PASTURES AND MEADOWS, IN JUNE AND JULY

CRESTED DOGSTAIL
GROWING IN MEADOWS. FROM JUNE

Yellow oat grass is so called on account of its bright yellow flowers. It is cultivated in France, but rarely found in America. It is a great favourite with sheep and cattle. Crested dogstail is nearly always to be found where chalk abounds. That is why it grows in great abundance, for example, in England, on the downs of Kent.

SOFT BROME

GROWING IN MEADOWS AND PASTURES, FROM MAY TO AUGUST

SEA-LYME GRASS

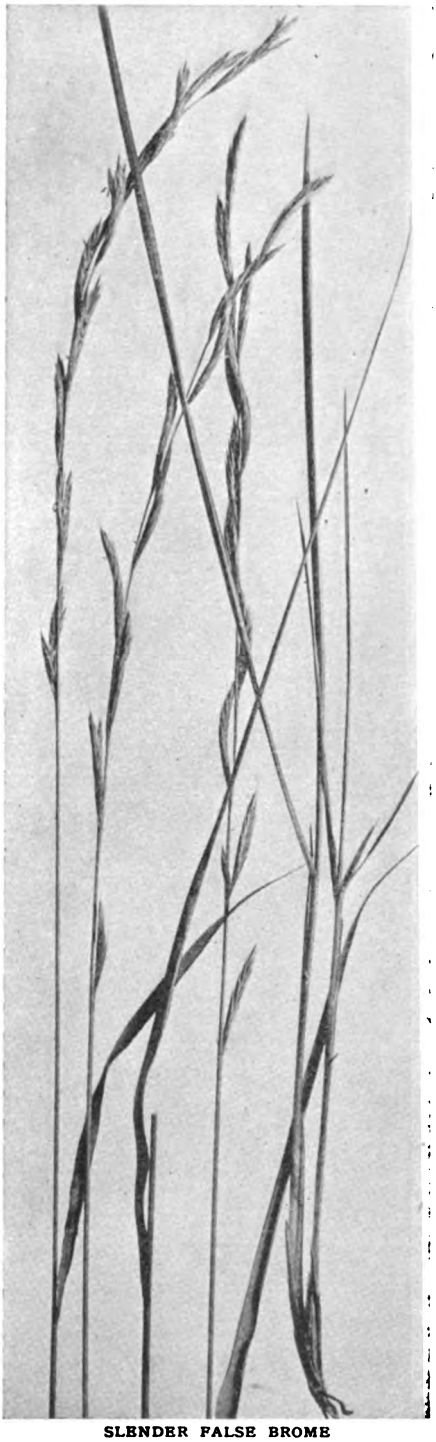
GROWING BY THE SEA, IN JULY

Soft brome is a very greedy grass. That is to say, it devours all the nourishment there is in the soil, and leaves any other grasses which may be about to starve and die. Sea-lyme grass is very much like sea-reed, shown on page 1334, and even grown-up people, who should know better, frequently mistake one for the other.

WALL BARLEY
GROWING IN WASTE PLACES, FROM JULY

BARREN BROME
GROWING IN WASTE PLACES, IN JUNE

We can generally find wall barley in country lanes huddling up at the foot of walls, but not very often growing out boldly in the fields. Its bristly spikes are quite sharp. Barren brome is so called because it grows in barren places where few other things will thrive. It is common in England, but rarely found here.



SLENDER FALSE BROME
GROWS IN SHADY PLACES, IN JULY & AUGUST

CREEPING SOFT GRASS
GROWING IN WOODS, FROM JULY ONWARDS

Some people say that false brome does not really belong to the brome family at all, and that is why they call it "false." It is really, however, entitled to a place among the bromes. The roots of creeping soft grass spread or creep underground very quickly, and this gives it its name. Cattle do not care for this grass.

MEADOW BARLEY
GROWING IN DAMP MEADOWS, IN JULY & AUGUST

FLOATING MEADOW GRASS
GROWING IN DITCHES AND BY RIVERS, FROM JUNE

Meadow barley is very like wall barley, except that it grows in meadows instead of hiding away at the foot of walls. Not only does floating meadow grass love the river-banks, but it often grows right up out of the water itself, sometimes bending over and floating on its surface, and it is commonly found in ditches from June onwards.

PERENNIAL RYE GRASS

ORCHARD GRASS

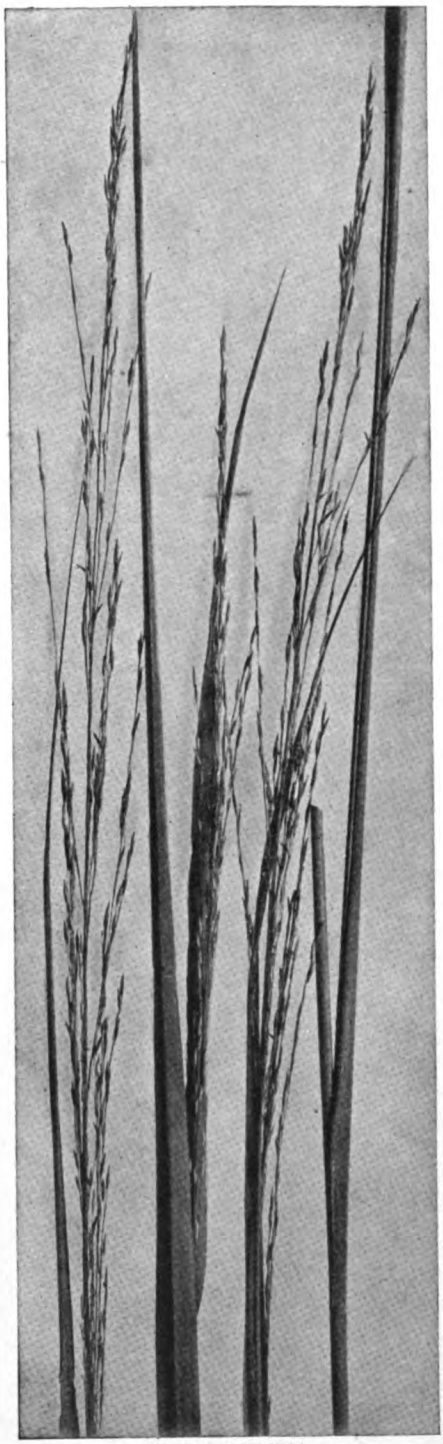
GROWING IN MEADOWS AND PASTURES, FROM JUNE ONWARDS

Rye grass is frequently to be met with in this country. It was the first grass to be gathered and cultivated in England. Orchard grass is very tall-growing. That is the reason why hares and rabbits are so fond of it, for not only do they eat it, but it is high enough for them to hide in.

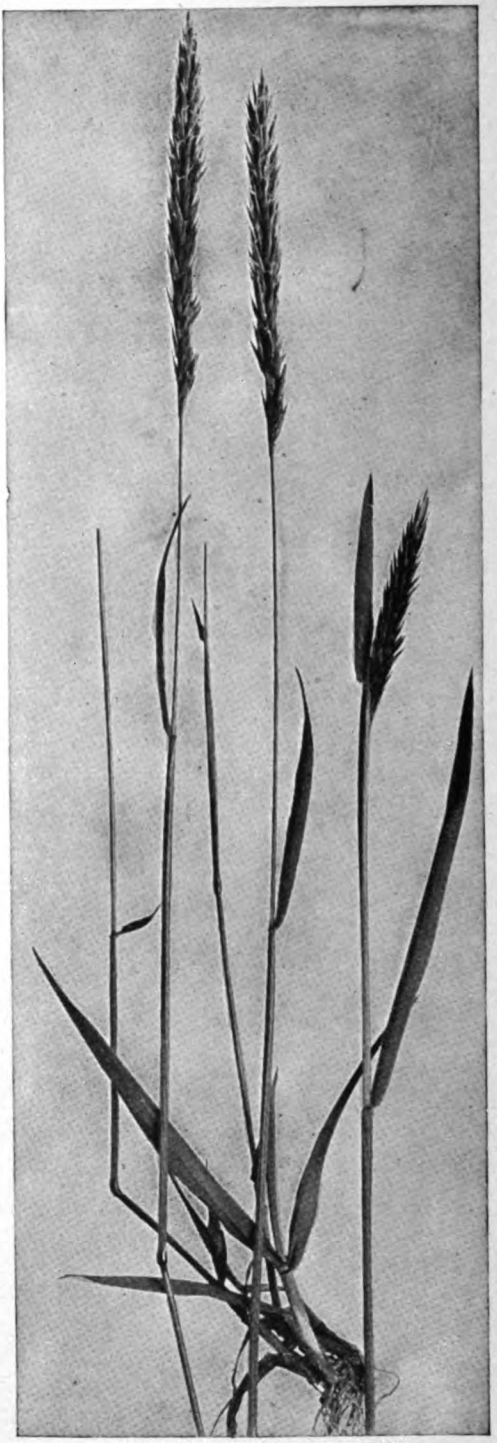
WOOD MEADOW GRASS
GROWING IN WOODS, IN JULY

ANNUAL MEADOW GRASS
GROWING ALMOST ANYWHERE, FROM MARCH

Wood meadow grass is a valuable one from the farmer's point of view, as it grows so quickly after the cattle have nibbled it down. Annual meadow grass is the first grass to appear in fresh ground, such as when a railway embankment has been cut. The seed is carried by the wind, and quickly germinates.



PURPLE MOLINIA
GROWING ON WET MOORS, IN AUGUST



SWEET-SCENTED VERNAL GRASS
GROWING IN MEADOWS AND PASTURES, FROM MAY

Purple molinia gets its name from the dull purple colour of its flowers. Sweet vernal is a lovely grass with yellow flowers. That delightful scent of new-mown hay is due in a great measure to the fragrance of this grass. The sweeter the scent of the hay, the greater the proportion of sweet vernal grass in its composition.

MEADOW SOFT GRASS
GROWING IN MEADOWS, FROM JUNE

REED CANARY GRASS
GROWING BY STREAMS AND PONDS, IN JULY

Meadow soft grass has smaller seeds than the majority of grasses. So small are they that, by weighing and then counting a small number, it is calculated that it would take nearly two millions of them to weigh a pound.

The photographs on these pages are by Henry Irving

THE NEXT FAMILIAR THINGS BEGIN ON PAGE 1409

THE KING OF THE CUCUMBERS

The King of the Cucumbers is a person of dignity. A large brass-headed furniture tack takes the place of an eyeglass in one eye, while the other is represented by a black carpet tack. His body is upheld by small rounded sticks, and his arms are wooden, too. The mouth, nose, and white of the eye are made by cutting away the peel.

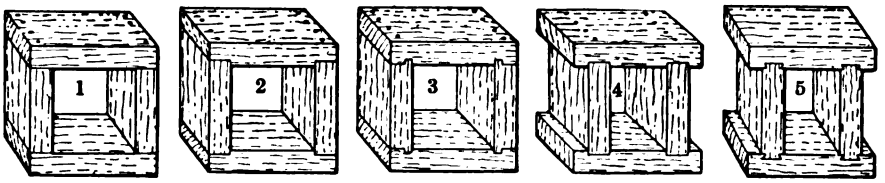
From "Lady Hollyhock and Her Friends," by Margaret Coulson Walker.

HOW THINGS ARE FASTENED TOGETHER

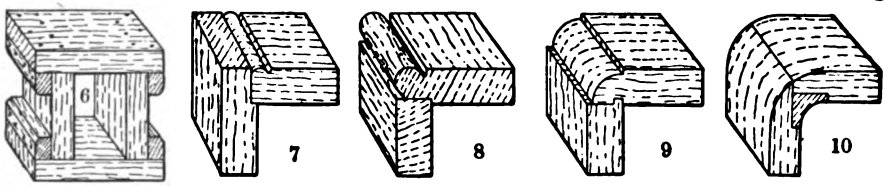
MAKING SIMPLE JOINTS IN WOOD

CONTINUED FROM 1288

In the workshops and factories of the world many things are made, because Nature provides *materials* only for man's service. Man has to shape Nature's products to his needs. Materials are of vegetable, mineral, and animal origin. They include wood, metals, ivory, horn, bone, shell, and other substances. These have to be cut, or brought in some way into the shapes required for use. Therefore, when more than one piece is wanted in the making of an article, *jointing* is necessary.



A boy soon learns that all joints are not made alike. He sees his father glue a broken corner of a chair or table. His mother mends a broken basin with cement. The carpenter makes joints in which projections fit into recesses. He also uses screws and nails. The parts of an engine are united with screw-bolts. The parts of a steel bridge are fastened with steel rivets. There are more than a hundred different ways of making joints. And for every one there is a good reason why that one joint should be used rather than any other in a particular case. Here we will consider some of the simple ways of joining woodwork.



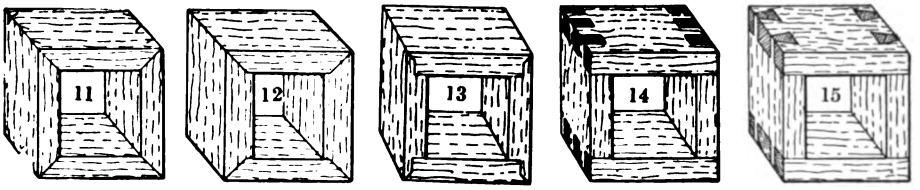
If you take a piece of board or, say, the cover of a box, you are aware at once that the direction in which the fibre, or the *grain*, runs is very important. You can perhaps bend and split it in the direction of its width, but not at all so easily in that of its length. The length is that in which the tree grows in height, and the fibres run in that direction. It is easy to split them apart, but not easy to snap them off crosswise unless the piece of wood is very slender. This is the first great difference which must never be forgotten when joints have to be made. You know, too, that sometimes a piece of board will shrink into a smaller width, or it may crack. But it will never become shorter lengthways, or crack in this direction. This fact, also, must be remembered.

Further, some woods are much harder than others. In some the fibres are straight, in others they are curly. But, in all, the differences due to direction of grain just mentioned are present. And the lad working at home, as well as the carpenter and cabinet-maker, has to employ joints in such a way that they will hold firmly and are suitable to the kind of work, and to see that the grain of the wood is arranged in the *strongest* direction so that it will not shrink and crack.

GLUED JOINTS. Glue is one of the common cements, made from animal gelatine. It is applied hot to the surfaces of wood joints, and when cold it holds so securely that the timber will often split before the glue

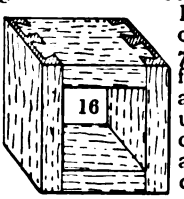
will part. But the joint must be made *along* the direction of the fibres, not across them, and only a thin film of glue must remain, as too much glue spoils the joint.

Glue makes a secure joint, because it runs into and occupies the minute vessels, as well as covers the surfaces in contact. If timber were like glass, glue could not unite it strongly. Neither will it hold well on the ends of fibres, or what is called *end grain*.

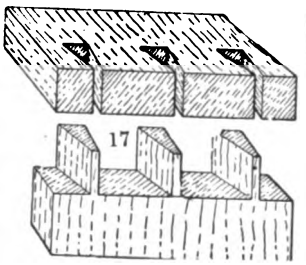


You could not, for instance, trust glue alone to secure the corners of a box. Not only would the "hold" of the glue on the end grain be weak, but the glued surface would be too small to be strong. In some cases, therefore, a glued joint is as strong as there is any need for, while in others it is almost useless.

NAILING. Nailing is a strong and quick means of holding pieces of wood together. It is rather a rough way, because the heads of the nails show, and this, in cabinet-work, would spoil the appearance of otherwise neatly finished articles. Wire nails are used a great deal now, and are made in many different sizes and degrees of fineness. Screws are generally used in work that may have to be taken apart again and that cannot be treated roughly. The only way to get nailed work apart is to prise it with a chisel or screwdriver, or, in the case of a box, a hammer can be used to knock it apart. Nails in wood should always be placed so that, if any cutting is to be done with chisels, gouges, or saws, there shall be no risk of damage to the cutting edges through coming into contact with a hidden nail.

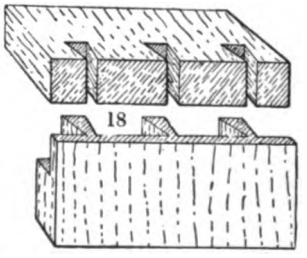


CORNER JOINTS. Pictures 1 to 16 show joints suitable for boxes and box-like structures. The simplest joint is in picture 1. In it the end pieces are nailed between the sides. If the box is longer one way than the other, the sides go the longest way. Plain joints of this kind are used a great deal, but only for rough work. Sometimes sides are *rebated*, as shown in picture 2. This prevents the ends from being knocked inwards, for nails alone are not sufficient to keep the parts exactly in position.



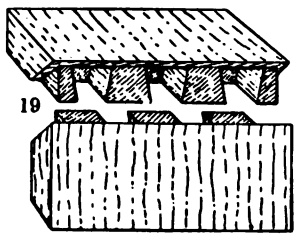
A better way is to form *tongues* on the ends fitting into grooves, as shown in picture 3. A stronger way still is shown in picture 4; but the sides then have to project beyond the end pieces, and there are not many cases where this can be allowed. Another improvement is shown in picture 5, where the ends fit into V-shaped grooves. This holds the parts together without nails. The ends, of course, have to be slid in sideways. Generally, such a joint is glued only, but it is troublesome to make, and is not often used. Picture 6 shows a rough but strong method, often used in making packing-cases. *Cleats*, or strengthening pieces, are nailed across the end pieces, thus strengthening them, and also increasing the joint surface, so that the box could not so easily be knocked "out of square" by rough usage as some of the others might. Pictures 7, 8, 9, and 10 show corner joints that are seldom used for entire boxes. The grain of the wood in these may run either way. In all the other examples it should only run the way shown. Pictures 7 and 8 are rebated joints, with a bead formed outside to improve the appearance and to make the line of the joint unnoticeable. Picture 9 has what is called an *ovolo* moulding at its corner, and 10 has both the outside and inside corners rounded. If its inside corner were square, it would not be necessary to fit in the piece as shown.

MITRES. Mitres are the joints used for neat, high-class box-work. The mitre, which in its simplest form is shown in picture 11, is the neatest possible joint, but there is no way of holding the parts together very strongly. The ends of all the pieces are cut to an angle of 45 degrees, and they then fit together as shown, with all the end grain hidden. Such joints are glued, but the glue does not hold well on grain cut at such an angle. Sometimes fine nails are used as well, but more generally sawcuts are made (as shown) after the pieces have been glued together and the glue has hardened. Into these sawcuts thin slips of wood or *keys* are glued, so making it difficult to pull the joint apart. Stronger joints are made by means of *stopped mitres*, as in picture 12, used when the sides are of different thickness from the ends; or, if they are of equal thickness, *lipped mitres*, as in picture 13, are strong. In these two last cases there are square



shoulders fitting, in addition to the portions which are cut at an angle.

DOVETAILS. The strongest corner-joints are made by cutting the joints so that they interlock. The simplest joint of this class is not really a dovetail, but is called a *lock corner*, and is seen in picture 14. These corners are cut by machinery, and are used chiefly for light and small boxes for packing things in. They are glued only, and are very strong, but the appearance of locked corners is not considered good enough for them to be used for anything but cheap boxes. In dovetailed joints, seen in pictures 15 and 16, the interlocking portions are wedge-shaped instead of parallel, like lock corners, and therefore there is only one direction in which they can be put together or drawn apart. These, also, are usually only glued.


19

You will observe that the ends of the dovetails have rather an unsightly appearance, and that the joint is not so neat, in fact, as the mitred one. But you may also have dovetails which are not visible, termed *secret* dovetails. They do not go right through, but only a part of the way into the sides, and there are several ways in which they may be fitted.

Pictures 17 and 18 show the separate parts of joints like those in 15 and 16. That at 17 is a dovetailed joint, and is the strongest way to join two pieces of wood. That at 18 is called a *lap* dovetail. It is secret only when viewed from one face. It is used chiefly for drawers. Picture 19 is a secret dovetail, which, when together, appears on the outside as a mitred joint.

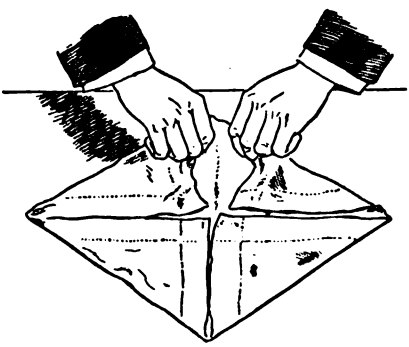
Secret dovetails are often made to appear on the outside the same as 13. Secret dovetails are, of course, more troublesome to cut, and are not so strong as plain dovetails, but, for the sake of neat appearance, they are preferred in high-class cabinet-work.

Strict accuracy in cutting is necessary for all dovetails, so that their fit may be perfect.

THE DISAPPEARING QUARTER

THIS is a capital trick. Two things only are wanted for it—a handkerchief spread out upon the table, and a quarter laid in the middle of it. The corners of the handkerchief are folded down over the coin, and anyone is permitted to feel that it is still there. And yet, at the conjurer's command, it passes through handkerchief and table, and is found on the floor beneath. The handkerchief is shaken out, and proves to be empty. This trick is good enough to make quite a reputation for the youthful wizard, and yet it is simplicity itself—when you know it!

In the first place we must have two quarters, in appearance as nearly alike as possible, and one of these we take an opportunity to drop quietly beforehand under the table at which we propose to perform the trick. The only other thing required is a little pellet of beeswax, the size of a peppercorn. This we must knead between the fingers till it is fairly soft, and then press, till needed in another sense, against the hinder part of our lowest vest button.



To perform the trick, take the wax off the button, and press it against one corner of the handkerchief which you are going to use. Then lay the handkerchief on the table squarely in front of you, with the waxed corner nearest to the right hand. Lay the quarter on the centre of the handkerchief, or, better still, let somebody else do this, to prove that there is "no deception." Then fold down the corners of the handkerchief one by one over the coin, beginning with the waxed corner, and pressing this down a little, so as to make it adhere. This done, we ask someone to make sure, by feeling through the handkerchief, that the coin is still there. Each person who does so presses the wax a little closer.

Now comes the exciting moment. "Now, ladies and gentlemen," you say, "I am going to make the sixpence pass right through the table, and be found upon the floor. If you will all be very quiet, perhaps you will hear it fall." They won't, but they may as well imagine that they do so.

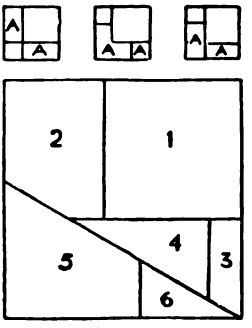
We blow upon the centre of the handkerchief, saying, "Presto! Pass!" Then, hooking the first and second fingers of each hand inside the nearer opening of the handkerchief, as shown in the picture, we draw the two corners smartly apart, one in each hand, and shake it out. The coin, adhering to the handkerchief, is drawn into the right hand. "Look under the table, and see whether it has gone through," you say, and while general attention is occupied by looking for and picking up the other coin, you will have ample opportunity to get rid of the one in the hand.

Of course we are not bound to make the coin pass "through the table." If we prefer it, we may order it to pass under a candlestick, into a vase on the mantelpiece, or even into somebody's breast-pocket. All that is needful is to place the duplicate quarter where we intend that it shall be found, and alter the command accordingly.

HOW THE LADIES CUT THE CARPET

THESE drawings show four ways in which the Japanese ladies might cut up their carpet according to the problem stated on page 1281.

In the first three drawings the carpet is divided into four pieces, and of these one sister has a large whole square; another, two parts (marked A, A in the drawing) which together make a whole square; and the third sister has a small whole square. If you take a thin piece of paper, you can trace the lines in the drawings, and cut out the pieces. In the second drawing there are a large whole square, a small whole square, and two parts (A, A) which, put together, make a complete square. In the third drawing you will again find that the two parts A, A make a whole square.



Now, supposing the carpet to measure 9 feet square, draw a square and divide the sides each into nine parts. Make a square on a side containing six of these parts. This square measures 6 feet by 6 feet, or 36 square feet; the small square in the opposite corner measures 3 feet by 3 feet, or 9 square feet; and the two remaining parts each 6 feet by 3 feet, or 18 square feet each; altogether 81 square feet.

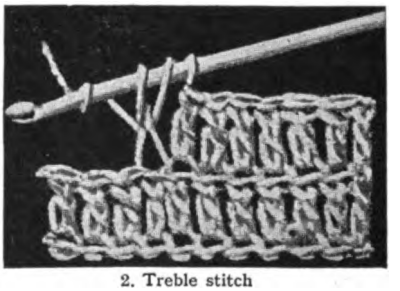
A boy or girl who understands Euclid, Bk. I. Theorem 43, and Bk. II. Theorem 4, will readily see how these two odd pieces of carpet together make a square, and how, in the other two ways of cutting the carpet, the whole squares can be made.

But if the carpet is to be divided up into three squares of *equal size*, it is necessary to cut it in the way shown in the fourth drawing, so that the first sister gets a square like the one numbered 1; the second sister a square made of pieces shaped like 4 and 5; the third sister a square made of pieces shaped like 2, 3, and 6.

A SIMPLE HOCKEY SCARF FOR GIRLS

CROCHET work is easily learned and quickly done, and with it one can make a great number of useful things. Wool, cotton, or silk thread can be used of innumerable shades, thicknesses, and kinds. The hooks are of steel for the thin cotton or silk threads; bone for wool and the stouter cotton. The size of the hook should be chosen to suit the thread in use.

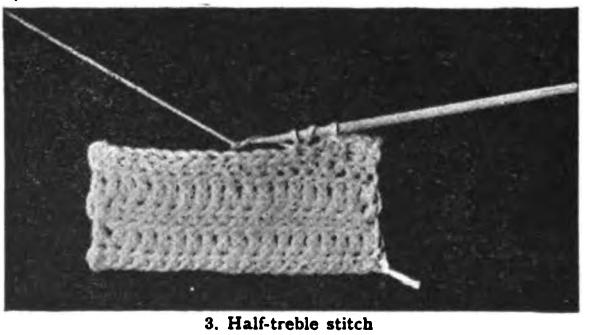
1. Chain stitch



2. Treble stitch

The materials required for the hockey scarf are: 3 skeins of white Berlin wool, costing 69 cents; 1 skein of coloured Berlin wool, 23 cents; 1 bone hook, 8 cents.

First we think about crochet stitches. As a matter of fact there is only one, because all crochet consists of loops made by means of the hook connected by being drawn one through the other. The variations of this looping are called stitches.



3. Half-treble stitch

For the scarf we must learn three: 1, chain; 2, treble; and 3, half-treble. The chain is used as a foundation for the others. The other two stitches are used in alternate rows, backwards and forwards, first the treble, then the half-treble. This makes a distinct stripe in the pattern.

To make the stitches, tie a little loop in the end of the wool. Take the hook in the right hand, hold the end of wool in the left, and place the hook through the loop. Twist the wool once round the hook and draw it through the loop, thus making another loop through the first. We thus make 40 chain stitches.

Twisting the wool round the hook to make another stitch is called an "over." So "making an over" is taking up wool on the hook by twisting it round once.

Treble stitches are worked into the row of chain already done. Keep the hook in the last chain (No. 40), make an over, insert hook in 39th chain, taking up two threads. Make an over, pull it through the 39th chain; make another over, pull it through two stitches on the

hook. Make an over, pull it through the two remaining stitches, and the "treble" is complete.

Then do the same again into the next chain. When you have done 40 treble, make one chain (this is to keep the edge even), and go back with the next stitch, called "half-treble." Keep the hook in the chain, make an over, insert hook in top treble of preceding row, taking up one thread only (that is, the one on the side nearest to you). As you work, make an over, draw it through the one thread, make another over, and draw it through all three.

We must not forget to take up one thread of the preceding row when doing half-trebles and two threads when doing trebles, or we shall alter the pattern.

Do a little piece like picture 3, which shows the half-treble. It will help you to get your stitches even, and teach you how tightly to hold the thread. Woollen crochet should always be loosely done. The wool is easily stained, and wears threadbare.

Occasionally count the number of trebles in a row to see whether there are still 40. It is very easy to miss one, or to make one too many.

Wool is sold divided into 1 oz. skeins, so the ¼ lb. will wind up nicely into four balls. Crochet three balls and about a quarter of the fourth into the scarf, and save the remainder for the edging and fringe.

4. The scarf complete, showing the coloured border and white fringe.

Next comes the border, which is a band of colour about 2 inches wide at each end. Make it in the same way as the rest, carefully joining the two wools with a tiny knot.

After the colour—which, by the way, may be your club colour—make another four rows of white, and then proceed to the fringe.

This is the easiest task of all, and this is how it should be done.

One has only to cut enough pieces of wool of equal length and knot them, two together, in between each treble of the last row. The best way to get the pieces even is to wind the wool round a piece of cardboard eighty times, and then cut them off along *one* side. This leaves all the pieces for the fringe ready to be threaded through in pairs and knotted once in the centre.

An ordinary postcard makes a good gauge upon which to wind the wool; it leaves the fringe a very suitable length—about 3½ inches. Make the fringe of the white wool, of course, and not of the coloured.

LITTLE PROBLEMS FOR CLEVER PEOPLE

THESE problems are continued from page 1288. The answers appear in that part of our book beginning on page 1501.

HOW MANY KNIVES AND PENS?

64. "You may give me three dozen pens and five dozen knives," said Uncle William when he was purchasing prizes for the boys at a Sunday-school picnic. Each knife cost twice as much as each pen. If he had bought three dozen knives and five dozen pens he would have saved $2.88.

What were the prices of the pens and the knives?

WHAT IS THE WORTH OF TIME?

65. An express train travels from Manchester to London at 40 miles an hour including stops. An excursion train runs from Manchester to London at 30 miles an hour including stops. The fare by the express train is one farthing per mile higher than the fare by the excursion train. Reckoning the value of his time, a commercial traveller decides that it costs him as much to travel by the excursion train as it does to travel by the ordinary train.

What is his time worth?

WHAT IS THE WORD?

66. There is a word of six letters, the meaning of which is made exactly opposite by changing the places of the two middle letters. What is the word?

WHAT WAS THE SUM?

67. Harry's sleeve had rubbed against his slate as he returned from school, with the result that many of the figures in his long division sum had become rubbed out. Putting a × to represent a place where a figure had become rubbed out. the sum was like this:

```
215)× 7 ×9×(1× ×
     × × ×
     ×××××
     × 5 × 9
     × 5 × 5
         × 4 ×
         × × ×
```

He remembered that the sum ended without a remainder, and, being a clever boy, he filled in all the figures that had been rubbed out.

How did he do it?

HOW MANY MILES PER DAY?

68. Hicks walked 117 miles, beginning on Sunday morning and finishing on Monday evening of the following week. He walked each day one mile further than the day before.

How many miles did he walk each day?

HOW MANY MARBLES HAD FRED?

69. "How many marbles have you?" asked Fred's mother. "Well," said Fred, "if you add one-quarter to one-third of the number, you will have ten more than half of the number."

How many marbles had Fred?

A LITTLE GARDEN MONTH BY MONTH

WHAT TO DO IN THE MIDDLE OF AUGUST

If there should happen to be a laurel bush inconveniently crowding upon your plants, you may cut it back this month, and the sooner you do it the better. But use a knife to do the work rather than garden shears, as you will with this be able to keep a more natural and graceful shape, and not cut through leaves, as happens with shears.

Perhaps the most important work of the month is the taking of cuttings. Those geraniums you planted out early in the summer have grown at least twice and perhaps three times the size they then were. If you have a window-seat in the house on which you can winter your flowers, or some corner in a greenhouse that in winter is heated, it is worth while to take cuttings at the present time, and then, beside the old plants you will take up before winter comes, you will also have some young ones for next year's planting,

How to pot the cuttings

Though we take a cutting of a geranium and describe how to treat it, it must be understood that the same operation and the same treatment will be needed for almost any kind of cutting that we wish to strike in a pot—fuchsias, bits of musk, the sweet-smelling scented verbena, etc. Make the cut which severs the cutting just below a joint, and, having secured the growth, trim off the lower leaves.

It is often said that cuttings, and especially soft-wooded cuttings like geraniums, strike root more easily when put in close to the sides of the pot. Put plenty of crock at the bottom of the pot in order to secure good drainage, then some nice light soil, with, if possible, a little silver sand mixed with it, and press it in firmly. Put your cuttings in their places, and fill up the pot with soil to about one inch from the brim, and press this also firmly down. Never fill up a pot with soil quite to the top, for if you do that you have no room to water properly.

It may be as well to say here that plants must not be over-watered. If the soil is continually in a saturated state, the plant decays and dies. The habit of keeping saucers under the pots to catch the water as it drains from them is a very bad one if the water is allowed to remain in the saucers. The water that drains into them should be emptied out *at once;* but for pots of cuttings there is no need to use saucers at all, for the pots may stand for several weeks yet in some sunny spot out of doors, standing on a board or a little bed of ashes, so that worms do not penetrate.

People seem very fond of the bright yellow calceolarias as summer flowers for the garden. But if you are to take cuttings of these, wait until October; that is quite soon enough for calceolaria cuttings.

There are more seeds to sow this month—indeed, there are but few months when we may not do a little seed sowing. Just now we may sow pansy seed—yes, and, more than that, if there be a few little vacant spots you may sow the seeds of some more hardy annuals. You remember you sowed some of these in April, and probably at the present time they are in full flower and beauty. Now, it is good to sow the seed in the spring of these annuals that are really and truly hardy, but it is even better to sow the seed, or at least some of the seed, in the early autumn.

I am going to ask you to sow the seed of some blue cornflowers some time during the next fortnight. You need the merest pinch of seed, even the smallest packet is more than enough. In a very short time you will have a number of tiny plants. Thin them out—always thin them, even if you have only half a dozen plants left—for these autumn-sown plants are going to be twice the size of any you sowed in the spring. When they are four inches high, or thereabouts, very carefully pinch out the top of the growth. There will be three growths in the place of one, and you understand what a more bushy plant this means. But, more than this, if you wait until the spring you may pinch back each of those three growths, and make the plant far bushier still. You can move it, too, in the spring, if you wish, though it will be finer and better to let it flower where it is.

Cornflowers

You may ask why you were not advised to pinch back the cornflower plants you sowed in the spring. Chiefly because there is not the same long period before they need to flower, so that to do this in the spring would delay the blooming too long. Cornflower plants treated in this fashion will take as much room as three others, but let them have this space, for they are going to bear hundreds of flowers, and bloom nearly twice as long as spring-sown specimens.

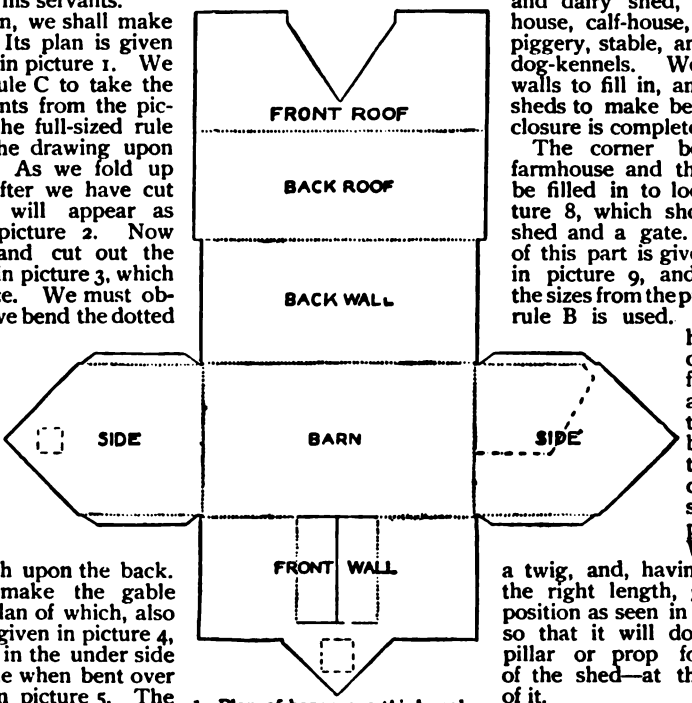
You may also pinch back snapdragons, and Blue Beard, and wallflowers, to mention but a few.

Notice, as you go about the garden, the plants that look particularly pretty when planted side by side; notice what makes a good edging plant, and what is best to put in the background. Notice, also, how people treat climbing plants; what they make edges with; what they do with rubbish; how a rose or a clematis covering an arch just seem to bring a most welcome bit of colour high above the level of the eye. We should have our eyes well open in the garden.

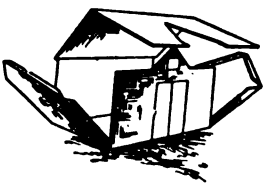
COMPLETING MODELTOWN FARM

We have already made the farmhouse and the dairy, also the houses for the cows, horses, pigs, and hens. The only important farm building that remains to be made is the barn, which is a very necessary part of the farmsteading. Crops may be stored in it, and the many different kinds of farm implements and machinery. Then, having made the barn, we shall make and fit up the various walls upon a large board, which will represent the ground upon which the farm stands, and we shall arrange upon this cardboard ground the many buildings we have erected in convenient positions for the work of the farmer and his servants.

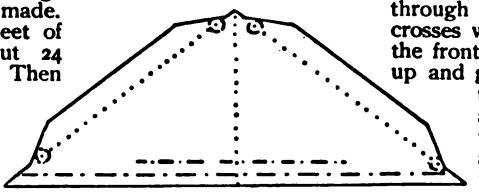
First, then, we shall make the barn. Its plan is given third-scale in picture 1. We use scale-rule C to take the measurements from the picture, and the full-sized rule to make the drawing upon the card. As we fold up the card, after we have cut it out, it will appear as shown in picture 2. Now we draw and cut out the plan given in picture 3, which is actual size. We must observe that we bend the dotted lines which have the circles from the back and not from the front of the card, so that we must cut the card half through upon the back. Then we make the gable strut, the plan of which, also full size, is given in picture 4, and glue it in the under side of the gable when bent over as shown in picture 5. The gable should now be glued to the roof of the barn as seen in picture 5, and the completed barn, with its wide swinging door, is seen in picture 6.



1. Plan of barn: one-third scale Use rule C



2. Folding up the barn



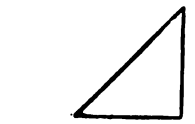
3. Part of barn roof: actual size

We now give attention to what is perhaps the most interesting part of our farm work—making the ground-plan of the farm itself, with places for all the buildings that we have already made. We must have a sheet of strawboard, say, about 24 inches by 15 inches. Then the plan given in picture 7 must be drawn upon this strawboard. The picture is one-third scale, so that we use scale-rule C to take our measurements, and our full-sized rule to draw the lines on the card. The lines in the picture are all solid black lines, but in this case we do not cut out the card at these lines. In fact, we shall not cut the card at all, but merely have the whole sheet of strawboard its full size. Then at a later time we may put other articles outside the farm proper, in the ground around the farm which the outer part of the strawboard will represent.

Having drawn the plan in picture 7 on our strawboard, we can glue down the houses in their proper places—the farmhouse, dairy and dairy shed, barn, cow-house, calf-house, hen-house, piggery, stable, and the two dog-kennels. We have the walls to fill in, and two more sheds to make before the enclosure is complete.

The corner between the farmhouse and the barn will be filled in to look like picture 8, which shows a cart-shed and a gate. The plan of this part is given half-scale in picture 9, and in taking the sizes from the picture, scale-rule B is used. When this has been cut out, it is folded up and glued to the strawboard so as to make the corner as shown in picture 8. We must get a twig, and, having cut it to the right length, glue it into position as seen in the picture, so that it will do duty as a pillar or prop for the end of the shed—at the wall end of it.

The next corner for our attention is that between the stable and the cow-shed, which, when finished, will look like picture 10, with a corner shed having a wall along part of its front. To make this, the plan in picture 11, which is half-scale, must be drawn on card, using scale-rule B, and then cut out. By making two pinholes through the centres of the crosses we find where to glue the front wall inside. Folded up and glued into position to the wall of the stable at one end, and to the wall of the cow-shed at the other end, the result will be as shown in picture 10.

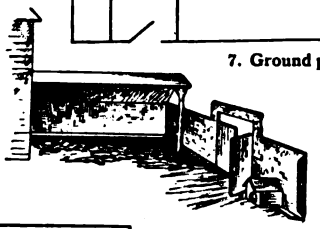


4. Gable strut: actual size

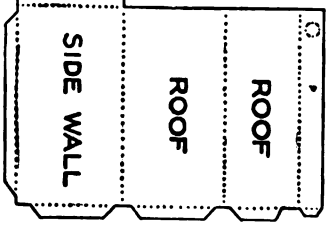
5. Gable window

6. Barn complete

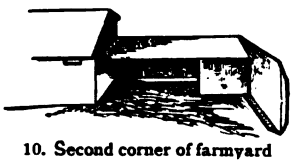
7. Ground plan of farm: one-third scale. Use rule C



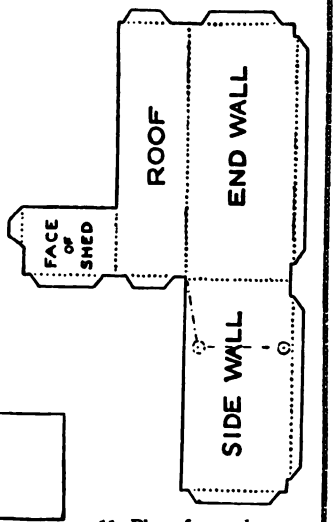
8. First corner of farmyard



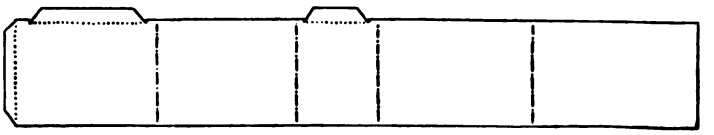
9. Plan of first corner: half-scale Use rule B



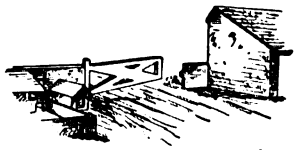
10. Second corner of farmyard



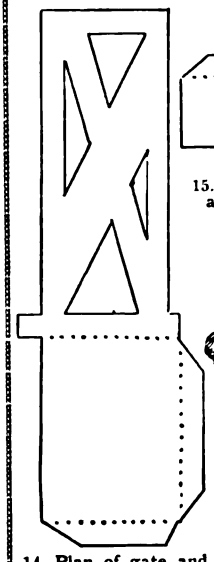
11. Plan of second corner half-scale. Use rule B



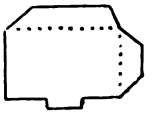
12. Plan of farm wall: half-scale. Use rule B



13. Fourth side of farmyard

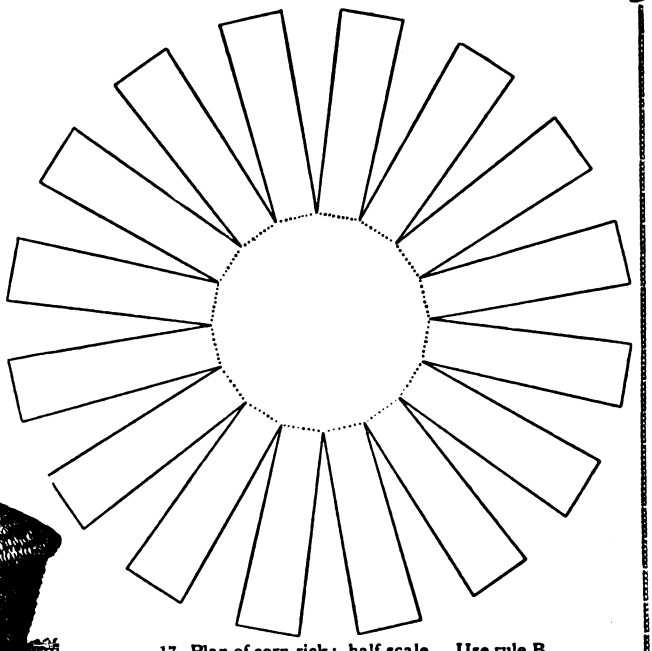


14. Plan of gate and wall: actual size



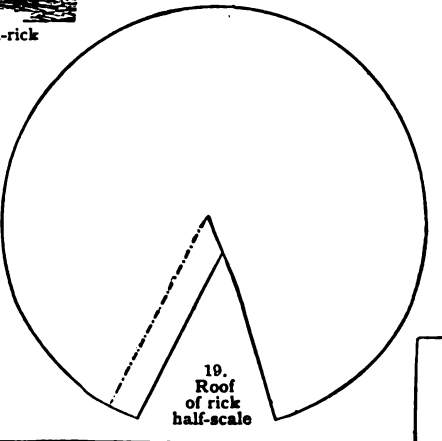
15. Short wall actual size

16. Corn-rick



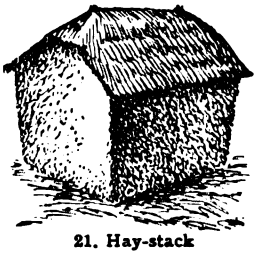
17. Plan of corn-rick: half-scale. Use rule B

18. Rick bent up

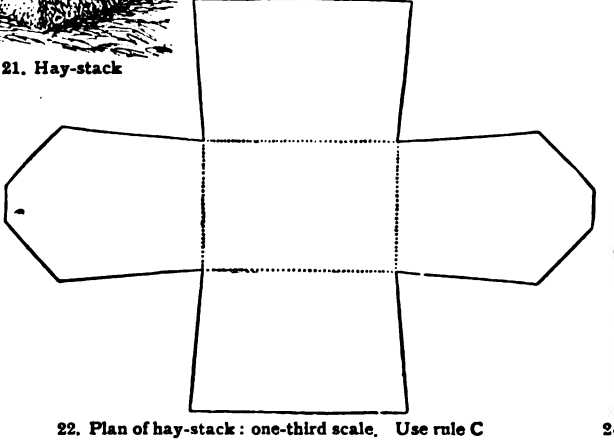


19. Roof of rick half-scale

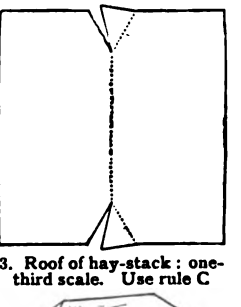
20. Top of rick



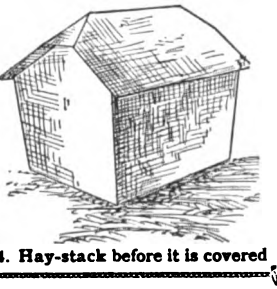
21. Hay-stack



22. Plan of hay-stack: one-third scale. Use rule C

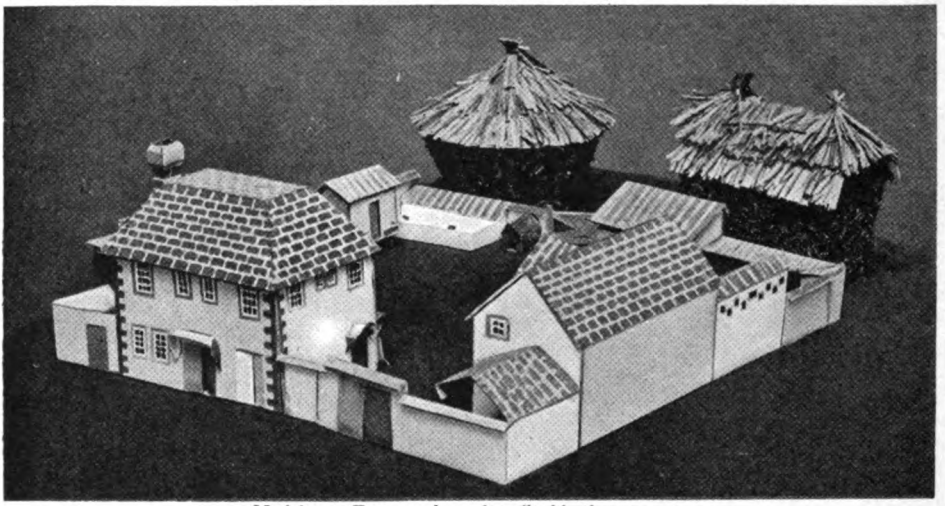


23. Roof of hay-stack: one-third scale. Use rule C



24. Hay-stack before it is covered

The dairy, the calf-shed, the hen-house, and the piggery are already in position. A wall will extend from the dairy to the piggery, and thus enclose the farmyard on that side. The plan of this wall is given half-scale in picture 12. The end with the folded slip will be glued to the dairy, and the other end to the side wall of the piggery. Observe that the back of the dairy projects a little from the face of the wall outside. There remains only the fourth side of the farmyard to be finished, that between the piggery and the stable. This part is seen finished in picture 13. The plan of the larger portion is given in picture 14, which is made actual size, so that in drawing it we use the full-sized scale-rule, both to take the sizes from the picture and to make the drawing on the card. This part is glued to the end of the piggery and to the back of the kennel, as seen in picture 13. Finally, the plan given in picture 15 is drawn full size, cut out, and glued to the back corner of the stable, and this part also is complete.



Modeltown Farm made as described in these pages

Upon that part of the farm ground close to the farmsteading, we frequently see on a real farm stacks of hay and of corn. We will take the corn-rick first. It is seen finished in picture 16. Picture 17 gives a plan of the body of the corn-rick. It is half-scale, so that we make our drawing by using scale-rule B. The plan is cut out and half cut at the dotted lines. Then the card is bent up, and it will be as shown in picture 18. The easiest way to make the sides stand erect in their proper positions is to take a strip of paper and gum it on inside the walls. Some postage-stamp edging will do nicely for the purpose.

To make the top of the rick, compasses are necessary. The legs of the compasses are set 2¼ inches apart, and a circle is drawn. This is making a drawing of the plan shown in picture 19, which is half-scale. Complete the drawing by making the two black lines leading from the edge, and the one chain line leading from the centre to the edge. Cut out at the black lines, and fold over until the chain line is close to the solid black line that goes from the centre to the edge of the circle. Now we glue the slip that goes under one edge, and hold it until it is firm, and have a lid-shaped top, as seen in picture 20. This we glue to the sides of the rick which we have already made. Now we cut pieces of straw—the thinner the better—into very short lengths, and, after covering the sides of the rick with glue, we sprinkle on the pieces of straw. We cut some longer pieces of straw, say, about one inch long, and split them if they are rather thick. Glue a band of straws on to the top right around the rim, projecting well over the rim, and about three-quarters of an inch up the top. Glue on another band higher up, projecting over the first band, and then a third band in the same way. Finally, take about a dozen thin straws and tie them into a tight little bundle close to one end, spread the other end, and place them upon the pinnacle of the rick and fix them with glue. We ought now to have a very realistic representation of a corn-rick as seen in picture 16.

Lastly we make the hay-stack, a picture of which is given in picture 21. Its plan is given one-third scale in picture 22, so that we use scale-rule C for taking the measurements. Having drawn and cut out the card, we fold it up as usual, either gluing the edges to each other or using gummed paper inside the stack. The top or cover is given in plan in picture 23, and this also is one-third scale, so that again we use scale-rule C. When we have cut out the card and bent the roof, we find that the ends at the top take the form in picture 24. We glue these parts into the form there shown, and finally glue the top to the sides. Then we cut into very small portions some sweet hay, glue the sides of the stack, and sprinkle the chopped hay over the card. We thatch the top like the corn-rick, and so complete Modeltown Farm.

THE NEXT THINGS TO MAKE AND THINGS TO DO BEGIN ON PAGE 1501

WHAT THIS STORY TELLS US

THERE is only one nation in the world that has a whole continent to itself. It is Australia, a part of the British Empire, as far from England as it can possibly be, for it is exactly on the other side of the earth. England's midday is Australia's midnight; England's summer is Australia's winter. We read here the story of the way in which this great wild country, still the home of black savage races when our great-grandfathers were born, has become a white nation. It is a great, strange land—a land of fruitful areas and pathless deserts, of tremendous mountains and enormous forests, and if there were not trains and telegraphs and newspapers and all signs of civilisation there, we might think sometimes that Australia was still at the beginning of time. For here live still the oldest animals in the world, birds with hairs instead of feathers, jackasses that laugh, swans that are black, and foxes that fly.

AUSTRALIA, THE GREAT SOUTH LAND

CONTINUED FROM 1248

To visit Australia, where there is the only people in the world inhabiting a whole continent, we must travel part round the globe, for this part of the British Empire is very far away from the United States, almost, in fact, on the other side of the great earth-ball on which we live over the whole of this vast territory.

We must go back to the times of the Stuarts for our first glimpse of it. A Spanish sailor, Torres, seems to have been one of the first explorers, and he left his name in the straits between the north of Australia and the island of New Guinea. The Dutch came next with many expeditions all through the seventeenth century, and for 150 years what was known of the island-continent was called New Holland. But neither Spaniards nor Dutch made colonies in the lands they found in this part of the world. Tasman, the explorer after whom Tasmania is named, did not even land in Tasmania, the island nearly as large as Scotland, that lies about 200 miles south of Australia.

About fifty years after Tasman, William Dampier, an Englishman, explored the west coast, leaving his name in Dampier Land, but he gave such a poor account of the dry and sandy coasts, and the barbarous natives he saw there, that for a long time no one cared to face the long voyage round Cape Horn or the Cape of Good Hope with so little reward at the end of it.

These first dwellers in Australia, owing to very poor food, were stunted and stupid. They generally lived a wandering life, sleeping in holes in the

When we, the English, and our friends in Canada are fast asleep at night, the Australians are in the midst of their brilliant day. When we are keeping Christmas in mid-winter with frost and snow, the Australians are keeping it in midsummer, with a festival of bright flowers and hot sunshine. When they look up to the beautiful night-sky over their heads, they see quite different stars from those we know so well in our northern half of the world—the Pole Star and those of the Plough. It is the stars of the Southern Cross that flame so brightly over the land that has taken them for her emblem.

What a huge, solid mass of land Australia looks on the map! Sometimes it is called the largest island in the world; sometimes the smallest continent. It is twenty-five times larger than the British Isles, and almost as large as all Europe. Let us see how it has come to pass that the Union Jack, together with the stars of the brilliant Southern Cross, floats

ground. They were considered the ugliest and most uncivilised of all the native races. It is slow and difficult work to try to improve the blacks, who seem to be slowly dying out as a race; they have never been numerous nor of much account.

Now, before Wolfe made his famous attack upon Quebec, a young sailor-officer was sent to sound the St. Lawrence and make charts to guide the ships which were carrying the troops.

THE SAD CHAPTER OF AUSTRALIA'S STORY THAT BEGAN AT BOTANY BAY

So well was this work done that later he was sent by George the Third to the far distant and almost unknown South Pacific to find new lands for England there. This was the great explorer Captain Cook, who was gifted with untold energy and perseverance. He approached "New Holland" from the Pacific, and on board was a friend who had gone out with him to study anything new they might meet with in birds, animals and plants.

They called the east coast which they explored New South Wales, and the spot where they landed they called Botany Bay, because of the rich harvest of all sorts of flowers and plants.

Botany Bay! Those words, which bring a picture of brilliant flowers to our mind, are the heading of a very sad chapter of Australian history. Eight years after New South Wales had been claimed for Great Britain, a very different party from that composed of the gallant captain, the enthusiastic botanist, and their bronzed and daring sailors landed near Botany Bay.

HOW 700 PRISONERS FLEW THE UNION JACK ON THE BIRTHDAY OF AUSTRALIA

It was on January 26, 1788—now kept with rejoicing as the birthday of Australia—that 700 prisoners, convicted of ill-doing at home, stood, with those in charge of them, around a flag-staff which had been hastily raised, and cheered as the Union Jack was run up to the top, to float out on the breeze. Then the Governor made a speech, hoping they would make the most of their chance to lead a new and better life in a new country. Till this time, convicts like these, who had broken the law in England and were punished in those days by being sent out of the land, were transported over the sea to the American colonies; but, when these colonies declared their independence, the discoveries of Captain Cook were used as settlements for the poor miserable people. This first convict settlement in Australia is always spoken of as Botany Bay, but the Governor of the new little colony settled on the magnificent harbour of Port Jackson, a little further north, on the shores of which has grown up, in about 100 years, the splendid city of Sydney.

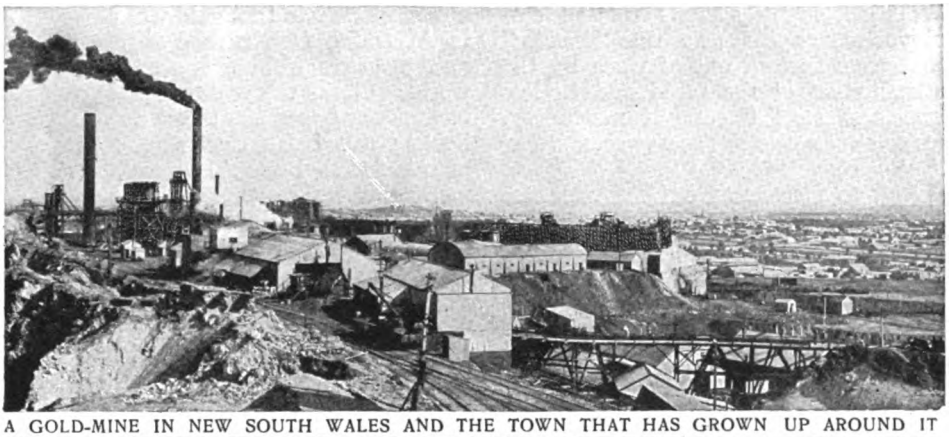
The little fleet of sailing ships bringing these first convict settlers had called on their way, during a long, dreary, cramped voyage of many months, at the Cape of Good Hope, to take in food and animals with which to stock their farms on arrival; for as yet there were no domestic animals in Australia; no sheep, cows, horses—not even rabbits; and no corn, nor vegetables, nor fruits, such as white people are accustomed to live upon. There was not a single animal from which to obtain milk, nor a single plant of which to make bread. At first there was much suffering from want of food and other necessaries, but by degrees farmers came out to settle, and things began to improve.

THE TROUBLED BEGINNING & THE WEALTH BEYOND THE BLUE MOUNTAINS

For a long time the colony did not grow quickly, for, besides the food difficulty, the presence of so many thieves and other idle characters was a great hindrance. Then, again, the great blaze of war which finished the mighty duel between France and England gave men plenty to do and to think about nearer home. The few who did go to Australia slowly settled the fertile and well-watered east-coast lands, and then the beautiful island of Tasmania across Bass Straits, for a rough and steep mountain range with great cliffs 2,000 feet high in parts shut them away from the wide uplands and deserts beyond them in the interior.

Then there came a change. A kind of sheep, famous for its splendid woolly coat, was brought to the colony at the beginning of the nineteenth century, and throve wonderfully. Then a way was forced through the rugged passes of the Blue Mountains, opening up vast grassy lands stretching away and away to the west. These "sheep runs" are often called the true wealth of Australia.

THE LAND OF WHEAT AND GOLD



A GOLD-MINE IN NEW SOUTH WALES AND THE TOWN THAT HAS GROWN UP AROUND IT

TEAMS OF HORSES PLOUGHING THE WONDERFUL WHEAT LANDS OF NEW SOUTH WALES

REAPING IN THE GREAT WHEAT-FIELDS OF NEW SOUTH WALES

Gold and wool and fruit are the chief things which make Australia rich. Science enables the gold-miner to get every scrap of gold out of the rock he quarries, mostly in the highlands of the south-east and west. It **enables the farmer to cultivate his land in the best possible way and to raise the most bountiful crops of wheat and maize. Science and honest toil make Australia one of the world's greatest storehouses of natural riches.**

Next, at the end of the war, after Waterloo, many soldiers wanted employment, as did also the "hands" that were thrown out of work by the introduction of the rapid and tireless iron and steel fingers of machinery.

THE SHEEP RUNS FROM WHICH MOST OF THE WORLD'S WOOL COMES

And so men came out to Australia. They became shepherds, living a rough life in huts while tending large flocks, roaming over the open country; or they leased tracks of land of their own and were called "squatters." These now live in comfortable bungalows called "stations," and are often helped by the "blacks," who make good stock-men. The sheep thrive because the climate is mild, and there is plenty of room for them to wander about and to find the tufts of wild grasses and shrubs which suit them well.

There are millions and millions of sheep now in Australia, which supply the greater part of the wool used in the world. Shorn from the sheep's back, the fleeces are tightly packed and brought down to Sydney and other great ports to be carried over the seas to keep busy the mills and workers in the busy manufacturing towns of the United States and England. Yet it is only little over one hundred years since the first fleecy sheep were taken to Australia!

Some men's fancy led them to farming and gardening, especially on the strip of well-watered coast land on the east slope of the mountains. This Great Dividing Range, which runs down the east side of Australia, is something like the Pennines, which part Lancashire and Yorkshire. Both influence the climate of the country to east and west, and both hold untold wealth in their rough sides. In the Pennines it is chiefly coal; in the Dividing Range it is chiefly gold, and it was gold that made the next great change in Australia.

WHAT HAPPENED WHEN A SHEPHERD PICKED UP A LUMP OF GOLD

A shepherd picked up a lump of gold while looking after his flocks, and brought it into Melbourne, a small village at that time, when Queen Victoria was a girl. There is nothing that excites people more than to hear that gold can be found in any particular spot; and as it became more and more certain that gold was plentiful in Australia, men rushed with spades and pickaxes from every part of the world. Clerks threw down their pens; students and teachers threw down their books; sailors left their ships; policemen left their beats; lawyers, doctors, merchants—all caught the "gold fever" and sought for the precious metal which was to be found in the gravel of the beds of streams and in the mountain slopes of the Australian Alps, as the southernmost part of the Great Dividing Range is called, some 60 or 70 miles behind Melbourne. This city of Melbourne grew suddenly very rich, for in ten years $500,000,000 worth of gold rewarded the "diggers."

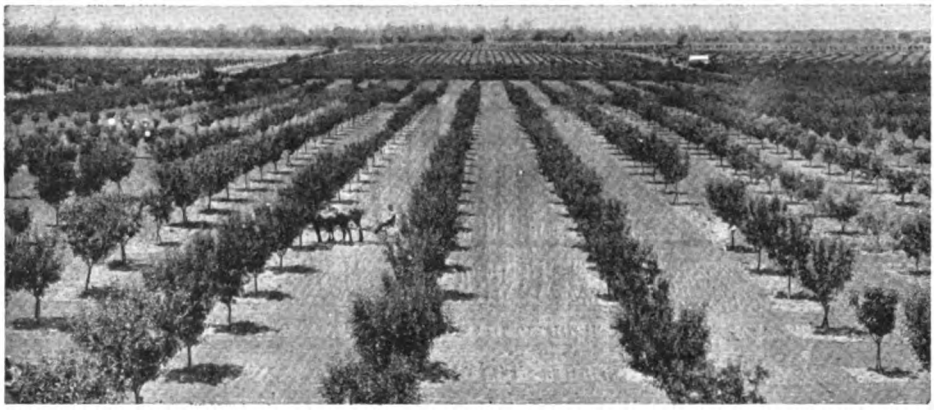
Now, all these diggers needed food and shelter and clothes, so the farmers got good prices for their meat, vegetables and flour, and a trade sprang up bringing manufactured things from England. Then, again, when the first richness of the finds abated, many of the diggers settled down to farm and grow fruit, or keep sheep on the lands they had discovered in their hunt for gold, and the land proved good for these purposes.

VICTORIA, AUSTRALIA'S SMALLEST STATE, WHERE THE GOLD COMES FROM

There was no question about the colonies growing now, and by degrees the states took shape as we see them to-day, starting from the large, original colony of New South Wales.

The gold colony, Victoria, about the size of Great Britain, was cut off from New South Wales in 1851. Although the smallest, it is one of the richest and most important of the colonies, and the most thickly peopled in Australia. Besides the gold which is still mined in it, Port Philip receives and sends away great quantities of wool from the pastures of rich grass which cover about three-quarters of the province, and the fertile soil and mild climate are good for growing all sorts of corn, fruits and vegetables. Its capital, Melbourne, is so fine with its wide streets, splendid buildings, its great trade, needing miles of busy wharves, that it is often called "Marvellous Melbourne." Trolleys, omnibuses, hansoms, motors carry passengers about as in America, and there is as great interest in cricket and football as in

THE NATURAL WEALTH OF AUSTRALIA



ONE OF THE WONDERFUL ORCHARDS OF WESTERN AUSTRALIA, WITH A VINEYARD BEYOND

THE ENORMOUS LOGS CUT FROM THE GREAT FORESTS OF AUSTRALIA LYING AT THE SAW-MILL

PREPARING WOOL TO BE SENT FROM AUSTRALIA INTO ALL PARTS OF THE WORLD

The wealth of the world is all in the soil. Men have only to develop it. Here by their labour they have created vast orchards and fruitful vineyards. They have cut timber which the steam-saws make into boards for building houses. They have bred sheep which yield abundant wool, that is packed up and sent away from the seaports to America and other parts of the world, to make warm clothes for us in winter.

any town in Great Britain. Crowded pleasure boats steam about the bay, beautiful tree ferns grow in the valleys close by, and delicious fruits are to be had for a few pence a pound in the shops.

NEW SOUTH WALES, AND HOW SQUATTERS HAVE BUILT UP ITS PROSPERITY

New South Wales threw off a northern colony called Queensland in 1859, but the land it has kept under its old name is twice as large as California. The chief industry of New South Wales is still wool. The squatter, who also rears great herds of cattle, has two great difficulties to face. One is that there is often very little rain for months together, and the food for the flocks and herds dies down—all but the shrubs which grow on the desert lands, and sometimes the poor animals die in thousands for want of water when the springs and rivers are all dried up.

The other difficulty is rabbits. It was a sad day when these little creatures were brought to Australia. They have increased so enormously that they often completely spoil a squatter's run by eating up all the grass needed by the sheep. Great efforts are being made to get rid of them.

New South Wales grows much fruit, such as oranges and peaches; also fine wheat and vegetables. At each side of its splendid capital, Sydney, are coal-mines; here is another Newcastle, black with coal-dust! There are other valuable mines, too, yielding gold, silver, copper, tin and lead.

Sydney is built all along the bays and promontories that make up the magnificent harbour. It is the fourth port of the Empire, as only London, Liverpool and Hull have a greater trade. Large ships can come up to any of the wharves right in the heart of the city, and busy little ferry-boats dart about from various points, carrying passengers and goods.

QUEENSLAND, AND THE NEVER-NEVER COUNTRY WHERE RAIN IS SELDOM SEEN

Queensland is about four times as large as California, and reaches right away to the north of Australia. The short slope towards the Pacific is hot and damp, and produces things which grow in this sort of climate, such as cotton and sugar and rich fruits. Higher up the slope is grown wheat, and above that in the highlands are wide stretches of downs where enormous numbers of sheep are fed. Passing on to the long westward slope the country becomes drier, and often great difficulty is found in getting enough water for the flocks and herds of cattle. Deep wells have to be bored, often without success, and after great expense. The part of Queensland that is subject to the greatest want of water is called the Never-Never Country. The Editor of this book has heard of a little Australian reader who had never seen rain when she was nine years old!

Brisbane, the chief city, depends on coal, found in its neighbourhood, and on wool. Queensland is rich in gold, copper and silver, and also sends away much timber.

SOUTH AUSTRALIA, THE WONDERLAND OF VAST DESERTS AND SPACES

As we look at the map, we realise the vast deserts that take up the centre and west of the island-continent. The province of South Australia, as large as France, Germany, Austria and Italy, put together, which is really a great slice of the middle of Australia from north to south, has most of this desert land. Many explorers have lost their lives trying to find out its vast unknown centre. It was not till 1861 that anyone succeeded in getting right across. A few years later, a splendid piece of work was done along this rocky and sandy track. Telegraph poles, telegraph wire, provisions, and all necessaries were carried from Adelaide on the south to Port Darwin on the north. Wells had often to be dug for water, and after two years of hard work and endurance a line of telegraph was completed over 2,000 miles long. Yet more than half of this distance had been travelled only once before by white men.

Thus Australia was connected with the rest of the world, for the messages flash from Port Darwin to Java, thence to India and the West. And so it is that we can read in our morning newspaper the account of yesterday's doings in the far southern hemisphere, whether they have to do with business about wool or gold, or with a concert or a cricket match.

There are no railways at present crossing Australia as they cross

THE BEGINNINGS OF A TOWN

CLEARING A FOREST TO MAKE WAY FOR A TOWN IN AUSTRALIA

DIGGING A HUGE TANK TO SUPPLY A NEW TOWN WITH WATER

OXEN MOVING A HOUSE WHICH HAS BEEN DIVIDED INTO TWO PARTS

This is the beginning of what may become a great city in Australia. First, strong men cut down the trees to give room for dwellings. Then others sink wells and make great tanks to hold the water. Others prepare sites for the houses, the wooden frames of which, ready made and roofed, are brought on wheels by oxen.

America, though there are many lines connecting the various towns and ports round the coasts with those of the mines and industries further inland.

A LONELY PART OF AUSTRALIA WHERE TRAINS GO ONCE A FORTNIGHT

From Adelaide, for instance, the train runs northward about 700 miles, but only once a fortnight to the last station on the line. When the bishop of this central part of Australia wanted to visit the settlers at the telegraph stations, which are about 150 miles apart from north to south, he had to ride or drive all the way, except the last 700 miles of train journey.

The climate of the settled south part of South Australia is like that of South Europe, and the same fruits grow in both, such as grapes, oranges, lemons, olives. A great deal of wheat, too, is sent away to Great Britain. Further north there are large flocks of sheep, and very valuable copper-mines.

Adelaide, the capital of South Australia, has fine parks and gardens, and behind it are lovely valleys, in which many kinds of fruits and vegetables are grown.

The richest silver-mine in the world lies in the bare desert country 350 miles beyond Adelaide. It is an astonishing sight to those who visit the spot. Scarcely forty years ago, Broken Hill was a lonely sheep station. Thousands of people crowded to it when silver was found, and now it is a large town. The huge engines for getting the ore out of the mines stand up against the sky. The furnaces and machinery give off incessant heat, amidst great noise, as they turn out tons and tons of silver and lead ready to go by rail to the sea-coasts. Then there is all the return traffic of fuel, food, and other necessaries, many of them brought from the other side of the world.

WESTERN AUSTRALIA, THE LARGEST STATE, AND THE ISLAND OF TASMANIA

Western Australia is the largest of the Australian states; four times as large as our Texas. A great deal of it is desert, like South Australia, and much is still unexplored. There are large forests; wheat and fruit are grown in parts, and there is country suitable for sheep and cattle. Gold forms the chief riches of West Australia at present. Great quantities are found at places where water has to be brought in pipes over 300 miles. Perth is the capital.

Tasmania, about the size of Scotland, is a beautiful island within a day's journey of Melbourne. Its narrow, fertile valleys are good for agriculture and fruit-growing, Tasmanian apples and pears being especially famous. From the sheep-farming comes very good wool. There is no trouble about want of rain in Tasmania, and the climate is so cool and pleasant that many Australians—especially from Queensland—come here to spend the summer. One of the most valuable tin-mines in the world is in Tasmania; there are also coal, gold and silver mines. Hobart is the chief town.

When we look at the divisions of Australia on the map, ruled off by the lines of latitude and longitude, we are reminded of Canada. As is the case with Canada, these large states with their straight boundaries are united, with Tasmania, under one common government.

HOW AUSTRALIA BECAME ONE NATION ON THE FIRST DAY OF THIS CENTURY

This federation took place on the first day of the twentieth century, and formed the great Commonwealth of Australia, which has, like Canada, a central Parliament, elected by itself to settle its own affairs, and a Governor-General sent from England to represent the king.

But how unlike are Canada and Australia in other ways! The north lands of Canada push up into the frozen waters of the wild Arctic Ocean; the north peninsulas of Australia reach up to the warm waters, infested with sharks, of the hottest part of the world.

In Australia there is no mighty river like the St. Lawrence, with its chain of lakes as large as inland seas, by which travel and commerce reach into the heart of the country. Many of the rivers and lakes in Australia dry up in summer, the Murray River with those that join it being the chief exception. Many of the lakes, also, are salt; and so it comes to pass that most of the centre of the continent—far away from moist sea-breezes—is a pathless stony desert, on which neither men nor animals can live. As we have seen, it is on the rim or edge of Australia, especially on the east and south-east,

THE TOWN, THE HOMESTEAD, & THE SCHOOL

ONE OF THE MANY TOWNS THAT HAVE SPRUNG UP IN THE VAST SPACES OF WESTERN AUSTRALIA

A NEAR VIEW OF A HOMESTEAD IN NEW SOUTH WALES

SCHOOL-CHILDREN LEARNING GARDENING IN WESTERN AUSTRALIA

While the farmer labours on the land, other men toil in the gold-mines. They all help to increase the wealth of the country. Towns spring up about the gold-mines, and near places where there are many farms. We see pretty homesteads growing up, and near them is the school, where the children are taught to carry on the work which their parents have so well begun. Here some of the schoolboys are carrying boxes of soil.

that we find most of the work and wealth for which the country is so famous.

We have seen, too, how far the fertile valleys and grassy slopes of the Great Dividing Range of mountains, together with the precious metals held in this rich storehouse of Mother Earth's, have all helped to make Australia what it is.

WHERE BIRDS WALK AND FOXES FLY AND SWANS ARE BLACK

No one knows how long before the white people came the poor savage blacks wandered over the broad continent, hunting the strange native animals, finding water, when all other water failed, at the roots of the desert plants, and living in holes in the ground.

Strange-looking animals and plants they are! There is the kangaroo, quite different from all other animals, with its powerful hind legs and tail, and a pouch for its little ones. The water-mole, with a bill like a duck, is equally curious; also the emu bird, which walks instead of flies. The kiwi wears hair instead of feathers; the laughing jackass and the brilliant parrots and cockatoos laugh or screech instead of sing. To crown all, the swans are black and the foxes fly!

The native plants and trees seem equally strange to us. Most of them shed their bark instead of their leaves; and many turn only the narrow edge of their leaves to the sun. The eucalyptus or gum tree grows to a great height, and gives a valuable medicine. Splendid timber comes from Queensland and other provinces, from great forests, very dull and grey-looking, lit up here and there with the vivid colours of the flying parrots and other gay birds. Many of the wilder parts of the country are covered for miles and miles with useless and dangerous plants, such as spinifex or porcupine grass and other prickly scrub. All these were the heritage of the "blacks."

THE GREAT ENERGY THAT HAS MADE AUSTRALIA A GREAT NATION

In the short space of time since the white nation came to settle in the island-continent, nearly every known plant that is good for food has been introduced, and finds some part of the country to suit it. Think of the work of the pioneers in getting the land ready, in choosing crops, in bringing to perfection all the produce of this wonderland.

Then think of the energy and hard work needed to start the mines and keep them going, often in hot parts of the country, and the anxieties and toil connected with farming, especially in the early days, when there were many difficulties, now smoothed away by new machinery, and by easy ways of carrying and packing and travelling.

Though so much has been started and accomplished in little over 100 years, every year sees some fresh outlet for the energies of Australians. The peaches that could neither be eaten nor sold, but had to be carried off in buckets to feed the pigs, because there were so many, are now tinned to feed human beings thousands of miles away. The grapes are made into wine, currants, and raisins; many fruits that would otherwise die are packed and sent oversea in cold chambers, just as quantities of beef and mutton are sent home, frozen hard in perfectly good condition. Manufactures of various kinds are starting, and only want a larger number of people to work them. In the four largest towns of Australia there are less than one and a half million inhabitants, and in the whole of the settled part of the continent there are not as many people as there are in London alone.

TEN THOUSAND MILES OF TRAVEL IN SIX WEEKS AT SEA

And now, having had a glimpse of what there is to see in Australia, shall we go to England by the Empire route—called the "All Red Route," because the whole of it is marked in the British colour, red, on the map—which has done so much towards linking up Australia with Canada and Canada with Britain?

We can take the steamer at Sydney, and make our way through the beautiful islands of the wide Pacific, gradually losing sight of the stars of the Southern Cross as we travel north. In about twenty-one days we shall slow down at Vancouver, the terminus of the Canadian Pacific Railway. About ten days more will bring us across the Dominion and the Atlantic Ocean to Liverpool.

There are many other routes if we prefer to go all the way by sea—through the Suez Canal or round the Cape of Good Hope or Cape Horn; but it will take six or seven weeks to complete the voyage of over 10,000 miles.

The next story of countries begins on 1459.

THE QUESTIONS IN THE WONDER BOOK

THE editors hope that you like the Book of Wonder in the volumes you have seen. The questions are those asked by real boys and girls, and among them you will find many that have puzzled you, we are sure. You may think that some of the answers are not very clear, and that is quite likely. Boys and girls have a way of asking questions that the wisest man cannot answer. Many questions which seem very simple cannot be answered at all, and about others the Wise Man can only tell you what students think. But there are hundreds of other questions which he can and will answer to your satisfaction. The last volume of our book will be an index, and in it you can find the whole list of questions which are answered in this department. You will be surprised to find how many there are.

WHERE DO THOUGHTS COME FROM?

CONTINUED FROM 1272

THIS is the question of questions, and there is no real answer to it except only just so much as will prevent us from believing false answers to it. We know certainly that the thoughts depend on the brain. If we are to do our duty to ourselves, we must regard the brain as the place where the real self lives. We must not poison it, we must not abuse it by depriving it of due rest, which we call sleep, and we should even think of every one of the other parts of our body as no more than its servants. The brain is the house of thought, but it is not thought itself, and though there is no harm in saying for convenience that the brain thinks, yet that will not do as an answer to our question.

There is a something which thinks, a something which knows. We cannot feel it, or see it, or cut it up, for it lies underneath all that we can see and cut up. The word substance means standing underneath—underneath the deepest that we can see. And so when you ask where the thoughts come from, I can only reply that they come from the thinking substance—the Something that thinks.

WHERE DO OUR THOUGHTS GO WHEN WE SLEEP?

Perhaps we should think of the brain as the instrument of the Something that thinks, as the violin is the instrument of the violinist. This, at any rate, is a beautiful idea which was expressed by a great Greek more than two thousand years ago.

When you ask where your thoughts go in your sleep, it is, perhaps, as if you had asked "Where does the music go when the violin or the organ is not being played upon?" When we are asleep the brain, or rather the highest part of the brain, is not acting. It remains alive, of course, and has the needs of a living thing. It requires pure blood, which is one reason why we should sleep in pure air, but it is resting as the violin rests in its case; so no thought comes from it.

We are never wholly asleep, however; part of our bodies is always working, and even part of the brain. Sometimes we can be sure that though the Self we know is asleep, yet part of the Self which we do not know so well is not asleep, for men have awakened with the answer to questions which they could not answer the night before. Many cases like this show that sometimes a certain amount of thinking goes on in our brains, even when we are asleep—or when, at any rate, the greater part of us is asleep.

WHAT MAKES US THINK?

In the first place, we think because it is our nature to think. We are thinking beings, and this it is which distinguishes us from all other creatures. We have brains so made that they are capable of being thought with, but we are very apt not to use our powers—just as the owner of a violin may leave it long in its case.

It has been said that "men think very little and very seldom." Many of us are too much taken up with the business of life. We stop asking questions, though when we were children we used to ask many. This is a very great pity. We think when we are interested. There must be something to start us moving. When we grow up and have to earn our living we often cease to be interested in many things that really do matter, and simply stop thinking about them; but it is a pity we do not think about the best things.

CAN WE THINK ABOUT THINGS THAT DO NOT INTEREST US?

No. We simply cannot think of things that do not interest us; it is interest that starts us thinking. And so everyone who studies the human mind likes to see a child who is interested, wants to know, and thinks over things by himself sometimes. It is that, and not the look of him, which proves that he is a human being and not just a nice little pet animal.

The grown-up people who are wise and who discover new truth are those who do not stop thinking when they grow up—and this is because they have not lost their interest in things. It will not do to say that we cannot help being interested or not interested, for everything is interesting if we will only give it a chance. We have only to begin to think about ourselves, or the world in which we live, to find that the more we think the more interesting the things we think about become, and the more we want to go on thinking.

CAN ANIMALS THINK?

The answer to this question depends entirely on what we mean by the word "think." We should not say *think* when we mean *feel*, and we should not use the word thoughts to mean feelings, as nearly everyone does. To think is really to put one thing and another together in our minds, so as to make a link between them, and when the two things are linked together like this, that is a thought. To feel that you want your dinner is not to think, but to say to yourself "I am hungry" is a thought, because you have put together in your mind your idea of yourself, and the idea you have of that feeling which we call hunger. So, if we use the word properly the answer must be that animals can scarcely think at all, but that some of the higher animals—such, for instance, as dogs—do, beyond a doubt, act sometimes in a way which can only possibly mean that they have somehow "put two and two together" in their minds, and to do that is to think. The answer, then, is that some animals, at any rate, are capable, though only in a very small degree, of doing what we should certainly call thinking if they were men and not animals in whom we saw the results of it.

WHY CANNOT ANIMALS TALK?

The answer to this question also depends on what is really meant. We know that many animals can express something of what they feel to each other, and to us. The different cries of a baby are a kind of talk; so are the differences in the sounds a dog makes.

But as we usually mean the word "talk," animals cannot talk. Even if they imitate our words, their talk is meaningless to them. The answer to the question why this is so is that the brains of animals, even the cleverest, and such as may have lived all their lives in human company, and so have been educated as much as may be, are so vastly inferior to our brains that animals have not mind enough to enable them purposely to use special sounds with special meanings.

The throat, voice-box, tongue, and mouth of an animal are, in their way, just as good as ours. Indeed, a dog's voice takes longer to tire than most men's voices. It is the nature of the brain of the dog that prevents him from talking. To talk as human beings talk requires at least a little, though perhaps not always very much, of the special powers which the human mind alone has, and which, so far as the wonderful brain is concerned, are connected with the great size and marvellous structure of one of its parts, with which no animal has anything worthy to compare.

WHAT IS A THOUGHT?

We should always make a point of using the word thought in the strict way to mean the putting together of two ideas. "Tom is good" is a thought. It puts together the idea of Tom and the idea of goodness. We say that there is a relation between Tom and the state of goodness. "Tom is not good" is another thought,

asserting another kind of relation between Tom and goodness. So it has been said that thinking is relationing. If the relationing corresponds to the relation of the facts, then the thinking is true; if not, it is false. Of course, we cannot help asking ourselves what it is that does this relationing or thinking, whether rightly or wrongly—we all do it in both ways. Some people would say that it is your brain that thinks, but I will say that it is your brain by which *you* think.

DO WE THINK IN WORDS?

This question fits in with what we have been saying. We can think very simple thoughts, but they must really be very simple indeed, without the use of words, and to that extent animals may think, and sometimes do. They think without words just as far as we can. But this is almost nothing. Practically, all our thinking is done in words. What we must try to remember is that words are good servants but bad masters. Too many people allow words to lead them astray. Instead of words being instruments for their minds to think with, they are chains in which their minds are bound. Every word has a meaning—that is to say, it stands for something, and words are not worth anything in themselves, except, perhaps, that some of them make beautiful sounds.

CAN WE THINK WITHOUT WORDS?

There are other kinds of what is really thinking, where the things which are put together or related are not words, but something else. Some men, for instance, in doing what is called algebra, can think without using words at all. They can find out, for instance, what this means: $A + B \times A - B$. Somebody has actually written to the editor of this book asking him to have it written in figures as well as in words! Or, instead of thinking in words or figures, they can think in lines and angles and curves, and find out all sorts of wonderful things in this way. Euclid could think in this way about as well as anyone who ever lived. Other men can think in sounds. One of the greatest musicians who ever lived, Beethoven, wrote some of the most marvellous music in the world, which will be listened to as long as men have ears, long after he had become stone-deaf. He put the ideas of the sounds together in his head. He could think in notes as easily as you and I can think in words.

WILL THE SUN EVER COOL DOWN LIKE THE EARTH?

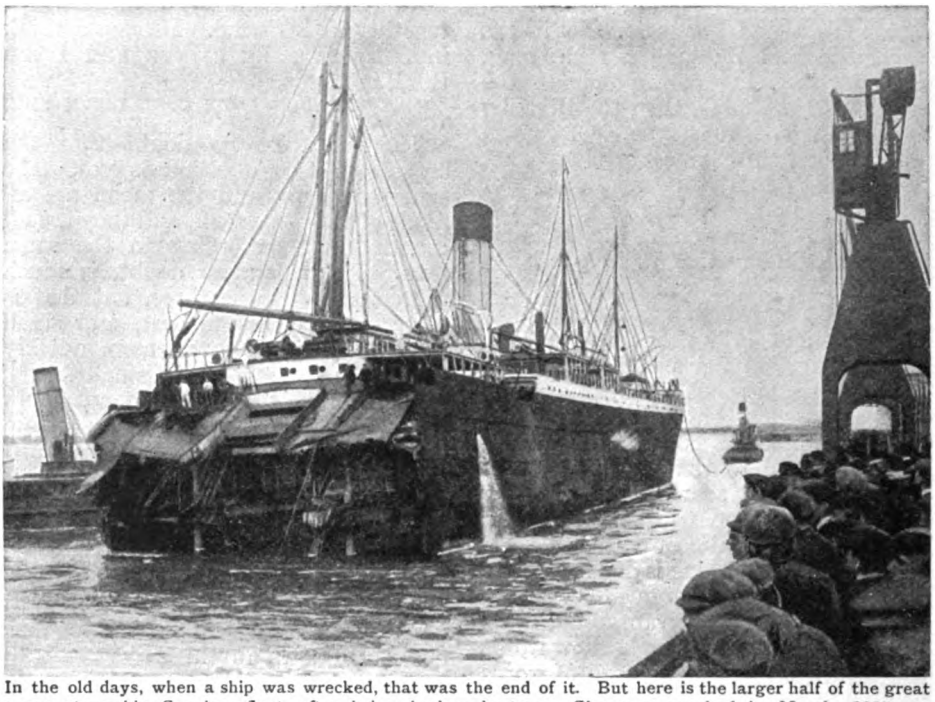
There can be no doubt that the answer to this question is yes. The sun, the earth, and the moon are all made of the same stuff, and they are all cooling down according to the same laws. The moon, no doubt, is much the coldest of these three, but that is because it is the smallest, and small things cool down much more quickly than large things, because small things, in proportion to the stuff that is in them, have such a large surface to lose their heat by. The earth is bigger than the moon, and therefore not yet so cold. The great planet Jupiter is very much bigger than the earth, and is still so hot that it probably makes a little light of its own besides what it reflects from the sun. The sun is very much bigger even than Jupiter, and so has not cooled down anything like so much. But if we study the sun, and compare it with other stars, we can be sure that the sun is cooling, and one day it must become cold.

WILL OUR WORLD EVER BURN OUT LIKE THE MOON?

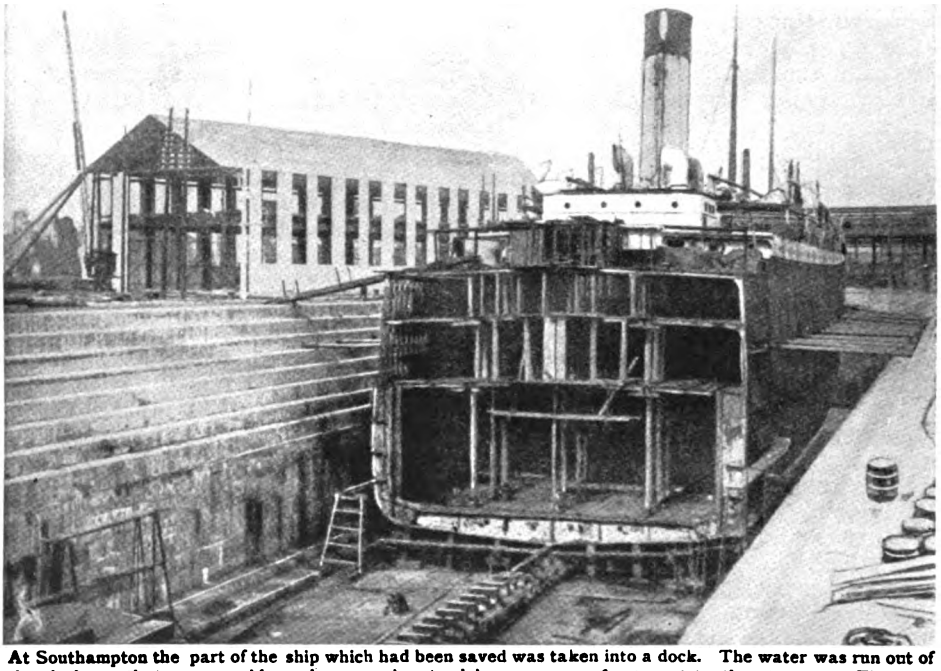
There can be no doubt about the answer to this question, though no one can tell how long it will take before the answer is fulfilled. Our earth must become like the moon. There will be certain differences, because the earth is much larger than the moon. The moon has been too small to hold to itself the gases outside it. It has no air or atmosphere. The earth is able to keep its atmosphere because it is bigger, and so the power of its attraction is much greater. Such reasons as this will always make a difference between the earth and the moon.

Another difference is that, in consequence of the rapid cooling of the moon, the changes on its surface have been more violent than those on the earth. The biggest volcano on the earth is nothing compared with those of the moon. But all these points of difference do not affect the fact that our earth is bound some day, though after a far longer time than men lately thought, to become cold and lifeless like the moon.

HOW HALF A SHIP WENT HOME

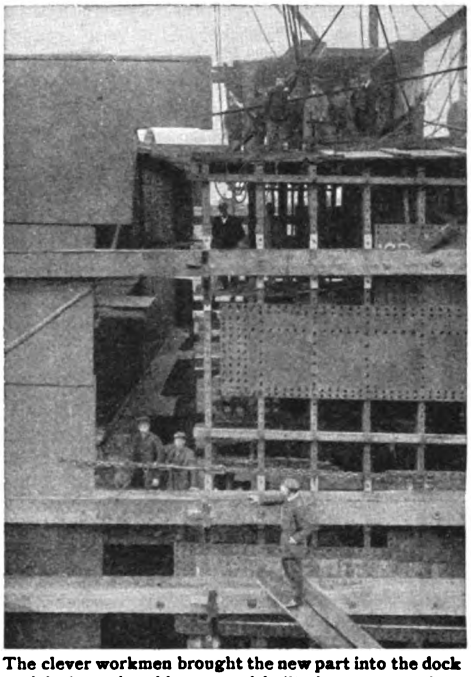


In the old days, when a ship was wrecked, that was the end of it. But here is the larger half of the great ocean steamship Suevic, afloat after being broken in two. She was wrecked in March, 1907, on **Lizard Point, Cornwall, and could not float off. She was broken near the middle. Divers went to work in the water under her, and cut away the broken part, and guns were fired at the deck to free the ship from her shattered front part. Then the powerful steam-tugs towed her to Southampton, 170 miles away.**

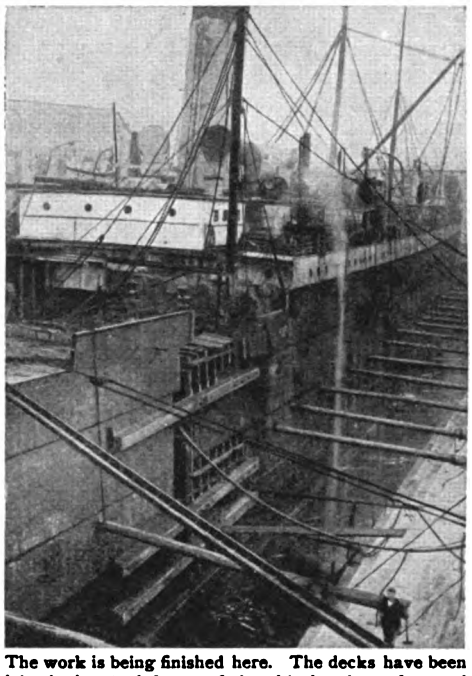


At Southampton the part of the ship which had been saved was taken into a dock. The water was run out of the dock so that men could work, preparing to join on a new front part to the steamer. The new part, called the bow, was built at Belfast, then towed over to Southampton, the voyage lasting a week

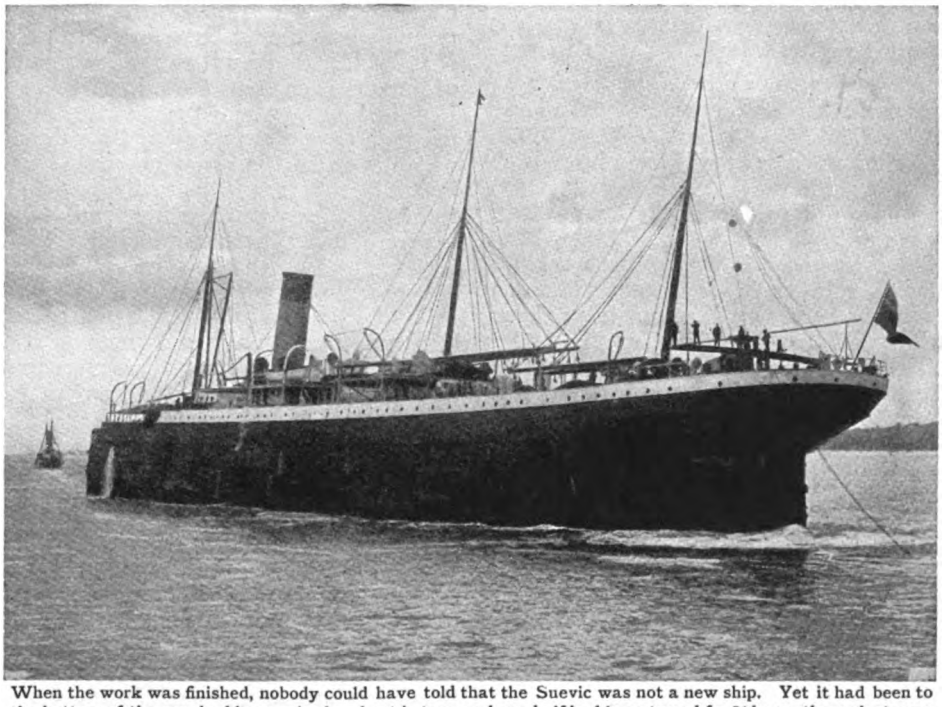
AND HOW IT WAS MADE WHOLE AGAIN



The clever workmen brought the new part into the dock to join it to the old part, and built the two together, like a builder adding a new room to a house.



The work is being finished here. The decks have been joined, the steel frame of the ship has been fastened together, and only a few steel plates have to be fixed.



When the work was finished, nobody could have told that the Suevic was not a new ship. Yet it had been to the bottom of the sea, had been raised and cut in two, and one half had been towed for 54 hours through stormy seas from the Lizard to Southampton, the other part coming from Belfast. You would never know that anything had happened to the Suevic. She is as good as new, after her experience in the ship hospital.

The photographs in these pages are by Stephen Cribb, Southsea.

WILL THE EARTH EVER BE COOL RIGHT THROUGH?

This question is just so put that we may begin to understand what a very long time indeed it must be before the earth gets cooled right through, as it is bound to do some day. If we want to cool our tea we put i in a saucer, partly because the cold saucer takes some of the heat out of it, but especially because it spreads the tea out, and so exposes it. In the same way, when we go bathing on a sunny day, we find the shallow pools on the way to the water much warmer than the water itself. Heat can get in and get out when things are exposed. But if we take a thing like a hot bottle, and wrap it up in a thick layer of blankets. it will be hot for many hours.

Now, there never were better blankets than those which the fire inside the earth is packed in. The air is a blanket very many miles thick. The crust of the earth, too, is a blanket. Also these blankets are being warmed from outside by means of the sun, and what with these facts and the fact that new heat is being made by radium, we can begin to understand that it will be many long ages before the earth is cooled right through. Yet so it must be some day. A thing may be very slow and yet very sure.

WHAT MAKES THE SUN ALWAYS HOT?

The answers we have just been reading tell us that "always" is too big a word to use of the sun's heat, even though the sun has always been hot ever since there have been men to look at it, and long before. The sun will not be always hot, nor has it been always hot. Long ages ago, before the earth and the sun were anything like what they are now, there was not nearly so much heat. The heat was gradually formed, it seems, as the great mass of cloud or nebula from which earth and sun were made shrank.

The central part of this cloud, the part which we now call the sun, has had a wonderful history, then, and we can see stars in various parts of the sky which show different stages of what has been the sun's history. It is almost certain that the sun was once much hotter than it is now; probably white hot, like the whitest of the stars.

It is now yellow hot; it will some day be red hot, and then gradually become dull and dark until the light goes out of it altogether. But this will be so many ages away that we cannot possibly imagine the length of them.

WHY DO WOMEN WEAR WEDDING-RINGS?

A wedding-ring is a useful and sensible thing which anyone should be proud to wear, but we should scarcely guess how it came to be used. Most of the people who study the customs of long ago are agreed that the wedding-ring really had its origin in the days when men used to own their wives. In those terrible times, which foolish people call the good old days, men used their brutal strength to make women their slaves. Now, it is customary to put a chain upon a slave, to put something round him to show that he is yours.

After a time, as men got a little better, instead of actually putting anything like a chain on their wives, or a ring round the neck or body, they invented something which would have the same meaning without being really bad. Anything that stands for something else, like this, is called a symbol; and we now believe that the wedding-ring began as a symbol, meaning that the wife was the husband's property.

It would astonish us to learn how many of our other customs arose in this way. For instance, when people are first married, they often go away for a time, which is called the honeymoon. There is no doubt that this really remains from the time when the husband stole his wife away from her family, and took her away with him. So bad things can become harmless, as well as good things become bad. However they came into use, these things and customs are certainly useful now, so that everyone can see at a glance that a woman is someone's wife, and may treat her with the special respect that is due to a wife and mother.

WHY IS IT BAD TO SLEEP WITH FLOWERS IN THE ROOM?

The reason is a very good one. While you are breathing in the night, you are spoiling the air in your room, and if the air were not changed during the night it would hurt you. But the flowers are doing just the same thing; they also are breathing, though very much less than you are, and so they help to spoil the air for themselves and

for you. Also, cut flowers are slowly dying, and as they die they are changed, and things are given off from them which are probably not good for you. Neither cut flowers nor living plants are good to sleep with, for both of them in the dark do nothing but help to poison the air in the room. I do not say that this is very important. I would much rather you slept with your window open, and had a few flowers in the room, than with the window shut and no flowers; but still, it is worth remembering.

SHOULD WE HAVE PLANTS IN A SICK-ROOM?

The last question is about sleeping with flowers. Now, that means living with plants in the darkness. Well, the answer to that when one is well is just the same as the answer to it in the case of a sick-room. Indeed, we should be more particular when someone is ill. But this present question asks nothing about sleeping. It is a general question about "all the time." The answer, so far as the time when the room is dark is concerned, is, of course, the answer to the last question, but the case is utterly different for the daytime.

The point is not whether one is sleeping or awake, but whether the room has or has not sunlight in it. As long as there is sunlight, it is very good to have plants, and especially with plenty of green leaves, in a sick-room. They are beautiful, and that is good. Most wallpapers with patterns on them are almost enough to drive an invalid crazy; but when the eye falls on green leaves it is always soothed and cheered. But a more important reason is that the daylight acts through the green stuff of the plant so as actually to make fresh oxygen in the air of the room by breaking up the carbonic acid gas which the ill person breathes out from his lungs. Plants in the daytime help to ventilate a sick-room, or any other room.

WHY DID NOT THE EARTH BURN UP WHEN IT WAS A BALL OF FIRE?

We know that burning is the thing that happens when anything is combined with oxygen. We know, too, that many things when they are made hot will burn in this way. If these laws were true long ago, as they are now, the earth should have burnt up, as you say. Well, the answer is that the earth did burn up almost entirely, so far as the outside of it is concerned. All the sea is burnt; all the water everywhere has been made by the burning up of hydrogen, and most of this happened long ago, when the earth was cooling down from a ball of fire. Not only are seas and oceans burnt, but the land is burnt also. We cannot burn clay and rocks and stones, for the very good reason that these are the results of the burning up, or combining with oxygen, which went on as the earth was cooling down from its hottest state ages ago. Apart from things which have been made by life, such as coal, there is very little indeed of the surface of the earth that is not already burnt; and it was burnt just in the way that this question suggests.

HOW DOES A PIGEON FIND ITS WAY?

This is a deeply interesting question which has long been a puzzle, and men have made all sorts of guesses to understand how pigeons can find their way home even over long distances, when they have been carried away in a closed box through which they could not see.

Most people think now that the bird finds its way simply by seeing. It has wonderful eyes. As it flies high in the air it can see for very great distances. As a rule it flies about until it sees something it knows, and then it makes for that. Sometimes the pigeons fail; and young pigeons are not so clever as old ones, probably because they do not remember so well—for you understand, of course, that the pigeon must remember in order to find its way home, and so we know that the pigeon has memory, as we have. It used to be thought that the pigeon had a special sense, which was called a sense of direction; and there may be something in this, at any rate, in the case of other creatures. But most people now believe that the pigeon's sight and place-memory are sufficient for it. We have to realise the enormous distances that it can see when it flies high enough, and also that it does not require to see its home, but merely any place that it remembers. An old pigeon has often flown a good deal round its home, in all directions, and if it can recognise any point on these occasions, that is enough for it.

WHAT IS AN ELEMENT?

This is a question which is answered in all the books on chemistry. They say that an element is made up of atoms of a particular kind which cannot be changed or broken up or put together, whether with each other or with atoms of some other element, so as to make atoms of any other kind. This is what has been believed during the whole hundred years since atoms were really discovered by the Englishman John Dalton. When we come to inquire of any given thing, then, whether it is an element or not, we have to find out what its atoms are like, whether they are all alike, what their size is, and so on. To study an element is to study the atoms that make it up.

IS RADIUM AN ELEMENT?

The answer to this is that radium is an element if anything is, but that, as we see on page 1295, the atoms of radium do not answer to what until now we thought atoms to be. They can and do break up, forming other atoms. Yet radium is an element for these reasons: it consists of atoms that are all of one kind—unlike a compound which is made of atoms of two or more kinds; these atoms can be weighed, and we know that they weigh about 225 times as much as an atom of hydrogen; and, like other elements, radium can be shown to give out a special light which, when we study it, ray by ray, is evidently the light given out by an element, and is different from the light given out by any other thing, just as the atom of radium is different from any other atom.

Radium, then, is an element as much as oxygen or gold is, but it is now necessary for us to change our ideas of an element simply by refusing to say in future that an element is made up of atoms which cannot be changed. They can be changed, though not by us, for we cannot control them or break them up as we can break up the molecules of a compound into their atoms; but we can watch the change. Atoms, however, really exist, and so do elements, just because atoms are of different kinds. This is all true, and we were never surer of it than to-day. It is no less true because we have just learned that atoms themselves are not simple, unchangeable things, as men have believed for about a century past.

HOW DOES THE SUN PUT OUT FIRE WHEN SHINING THROUGH THE WINDOW?

At this question the Wise Man simply laughed, and said, "I do not believe a word of it!" The answer to this question is that the sun does not put the fire out when it shines through the window, and there is no reason why it should do so. The reason for this belief is quite simple. If we light a match in the open air on a bright, sunshiny day, we can sometimes scarcely see whether it is lit or not.

Now, suppose we had lit that match in the dark, and then took it out into the sunshine, it would look as if the sun had nearly put the match out; but really it is only that the light of the match cannot make so much impression on our eye when it has the light of the sun to compete with; and so with the fire and the sun. Go into a dark room where there is a fire, and then turn on a brilliant light in the room; the light of the fire will seem to turn pale and poor.

That is all that happens when the sun seems to put out the fire. It is true that the brightness of the fire depends upon its getting a good supply of air; and it might be that the sunlight in a room made the air warmer and lighter, so that the fire was not fed with quite such a good draught. But I think the explanation given is really all that we need to answer this question.

WHY DOES GLASS NOT BREAK IF PUT IN COLD WATER AND BOILED?

Perhaps if you think for yourself, and remember some of the questions we have answered already, you may be able to answer this for yourself. Almost everything gets bigger, or *expands*, when it is made hot; and it gets smaller, or shrinks, or *contracts*, when it is made cool. If, then, we take a thing all in one piece, and do not heat every part of it to the same extent at the same time—something will have to go. That is what happens when a tumbler is cracked in the way we all know; but if the tumbler is put into water, and then the water is boiled, all the parts of the glass expand equally as it gets hotter. The *whole glass* becomes bigger, but there is no strain between its inside and its outside, and so there is no reason why it should break.

The next questions begin on page 1569.

WHAT THIS STORY TELLS US

SOLOMON confessed that one of the things that he could not understand was the serpent. Some things which Solomon did not know, men of later times have learned, but the mystery of the snake still remains. Those snakes that are poisonous can, in a few minutes, kill a man or a horse, or almost any other living creature. We can cure a man who has been riddled with bullets, or who has had the most serious illness, but one sharp bite from a poisonous serpent serves to defeat the skill of the cleverest doctors. There are nearly 2,000 different sorts of snakes, but in this story it will be sufficient to divide them into two classes—those that kill by poisoning, and those that kill by crushing. Of the poisonous ones, the worst are the cobras and the vipers. Each of these can cause death. Here we read about the habits of many of these terrible reptiles, of the places in which they live, of the food they eat, and of the way in which they do their deadly work.

THE GREAT SNAKE FAMILY

CONTINUED FROM 1224

THE serpent does not sting. Bees and wasps and scorpions sting. The poisonous snake bites, and the poison is squirted through holes in its fangs into the wound which these fangs cause. Snakes do not eat oxen and other animals of that huge size. When moving along the ground they do not move in arched curves as many of the school-books show. They glide along flat on the ground, but with the body curving in zigzags, like a twisted arrow.

The snake's spinal column is made up of a long chain of bones, which fit into each other on the ball-and-socket plan. Ribs join on to these bones, and work, of course, as the various parts of the backbone work. There may be as many as 300 to 400 bones in the backbone of the big snake, and ribs for nearly all of them. Now, these bones move with wonderful ease and suppleness, but they can move only from side to side. If the backbone could twist in all directions, there would be no safety for the spinal column of the snake. The snake can twist from left to right, and it can raise the front portion of its body, not easily, but surely, into an upright position.

How does the snake move? Every pair of ribs acts as a sort of foot. The whole of the snake's body forms one long foot. Each pair of ribs joins on to a strong scale under the body of the snake, and controls it by a slender but strong muscle. It is on the ends of these ribs, hidden though they are, that the serpent rests. When it wishes to go forward, it moves its ribs in such a way that they cause its scales to stick to rough ground, or the bark of a tree. It rows along the ground, the rib-points making the scales act as oars. Therefore, it must have a rough surface upon which to travel. On smooth ice or glass the biggest snake would be helpless.

The most wonderful feat of the snake is surely its tree-climbing. It goes up a great tree-trunk just as if it had feet. Some snakes have the remnants of feet, like little spurs. Others possess in their bodies the remnants of bones which once belonged to limbs for walking. But, though the spur-like limbs may help the snake which has them, most of the reptiles depend for their climbing only upon the action of their ribs.

They rob nests of eggs and eat the birds. They hang head downwards to snap any young deer or dog that may pass. A venomous snake will not hesitate to kill a human being.

Those faithful natives who carried the dead body of Dr. Livingstone down to the coast, at Zanzibar, had in the party a little native girl named Losi. While she was carrying water one of these fearful snakes dashed at her, struck her on the leg and caused a bad wound. In ten

minutes the poor little girl was dead. The party stopped there and buried her; then went sadly on their way.

A day or two later they were overtaken by an Arab, who told them that, while passing the same spot with another party, one of his friends had been struck by what they believed to be the same snake. The man thus attacked died almost at once. While his comrades were looking out for a place in which to bury him, they found the freshly-made grave of little Losi, and they buried the man beside her.

THE SNAKE AS LONG AS SIX MEN, WHICH HIDES IN THE BRANCHES OF TREES

There are many kinds of tree-climbing snakes. The giant boa-constrictors and pythons are expert climbers. The python is supposed to be the biggest of all snakes, but it is not. The biggest is a member of the family called the anaconda, a fearful creature, chiefly found in Brazil and Peru.

Along the Amazon and Orinoco rivers and their tributaries it is also known as "water-boa," and when full grown is said to measure forty feet or more. These giants climb trees. More frequently they are to be found in rivers, or lurking in still pools, resting on rocks, looking like fallen trees, but eagerly awaiting their prey. Out of the water they are not so agile as most snakes, but in the trees they are active and deadly. Big ones are said to seize human beings.

It is curious that the snakes which have most and best teeth do not kill by biting, while those which have fewest teeth do kill by biting. The boas and pythons kill by winding themselves in dreadful folds round their victims. The cobras and vipers kill by a bite, which opens the way for the injection of the horrible poison. How can the cobra so quickly kill its victim?

First of all it must approach. It has keen sense of smell, which enables it to detect the presence of an enemy. Next, it has the power of rapid movement, and of making a tremendous blow with its head. Its aim is sure; its bite certain. When about to strike, it raises its head, and inflates a curious hood at the back. Its tongue shoots forth from an opening in its upper lip, through which it issues from a protecting tube in the mouth. The tongue is forked at the end, and shoots in and out, quivering and darting in the most threatening way. The tongue is supposed to be the serpent's sting; but it is nothing of the sort. If it serves any part in the attack, it is simply to alarm the victim, and render him less able to defend himself.

THE TERRIBLE POISON THAT FLOWS DOWN THE FANGS OF THE COBRA

The cobra, when it launches itself upon its enemy, opens its mouth. In the upper jaw there are two teeth, and two only. These, when the mouth is closed, lie flat, like the baleen in the closed mouth of the whale. But the moment the mouth opens the two fangs stand up. They are fixed into the bone of the upper jaw, and are controlled by that jaw's movements.

When the mouth opens, the same action which sets up the teeth presses upon muscles which squeeze the poison gland. This causes the poison to flow out of the gland. The only way of escape for it is by way of the canal running through each tooth.

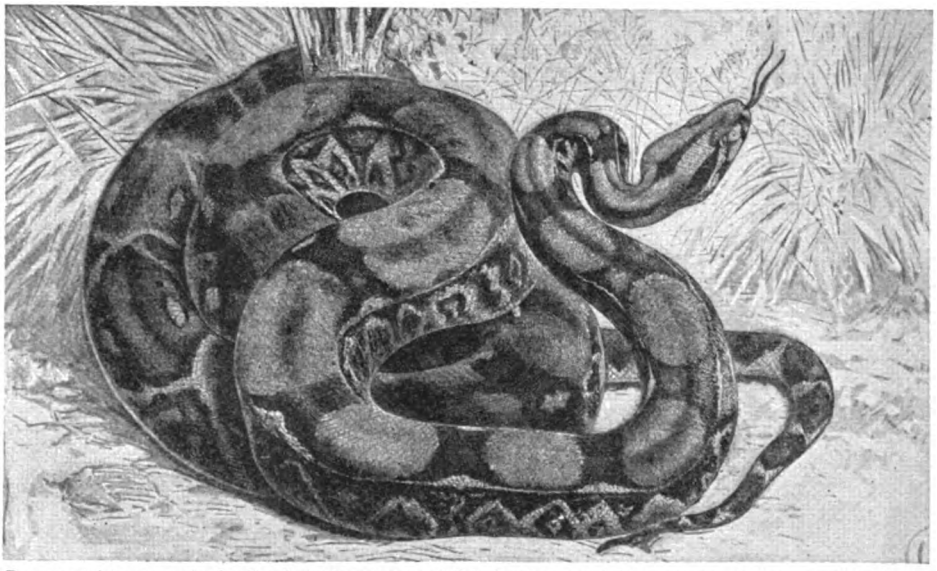
When, therefore, the cobra strikes, his sharp, erected teeth cause a wound in the flesh, and at the same moment the poison which is being squeezed through the tooth enters the wound. The poison enters the blood of the victim, and is carried into his system. Paralysis, suffocation, agony, and death follow.

A marvellous thing is that this poison, so terrible when pumped in through a wound, is quite harmless if swallowed. But there must be no wound on lips or tongue, for should it enter there death would be certain.

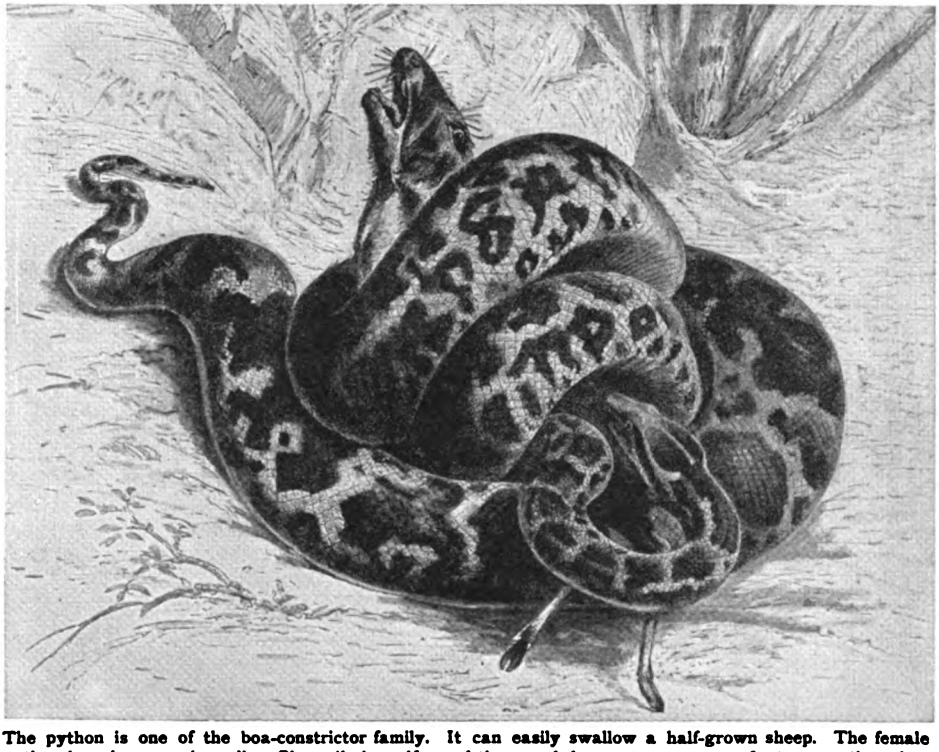
HOW A SNAKE POISONED A RAT THROUGH TWO TINY PINHOLES

Nothing else can better make us understand what cobra poison will do than a couple of bad incidents at the Zoo in London. Some years ago one of the keepers, who was foolishly taking liberties with an Indian cobra, was bitten by it. The bite of a cobra which has been for some time in captivity is not nearly as deadly as the bite of a cobra which is at liberty; but this man was dead in an hour. The next is a more extraordinary case. Here the victim was Frank Buckland, one of the most daring of naturalists. While at the Zoo he saw a cobra bite a

A SNAKE THAT CAN SWALLOW A SHEEP



Boa-constrictors are the family of giant snakes, and this is a boa-constrictor proper. It has no poison fangs. Seizing its prey with its teeth, it coils itself round it and crushes it to death. Then it eats the animal whole. **The boa is one of the largest snakes, but not so large as the python. It has a kind of hook like a spine instead of a hind limb, for no snakes have real feet or arms, and do not need them. It is an expert climber of trees.**



The python is one of the boa-constrictor family. It can easily swallow a half-grown sheep. The female python lays her eggs in a pile. She coils herself round them and does not move away for two months, when the eggs are hatched. Ordinarily, the blood of the snake is cold, but when hatching her eggs the python's blood is warm. If you touch a common snake, you will be surprised to find that it feels warm, not cold.

rat. The rat received one bite, and seemed instantly to know that its end was at hand. It retired to a corner with its eyes widely expanded, its mouth open, and vainly trying to prevent itself from falling. Then it sank down on to the floor of the cage—dead, three minutes after being bitten.

Now, Buckland determined to have that rat, and to see what the effect of the bite had been. He managed to get it out of the cage, and to examine it. There was not a sign of a wound outside, so he took his knife and began to skin the rat. Then he saw in the animal's side two tiny holes, like small needle-pricks. Only ten minutes had passed since the rat's death, but the flesh round about the wound had gone bad as if the rat had been long dead.

Buckland scraped away at the skin where he thought the snake's teeth had entered, using his thumb-nail for the purpose. Suddenly he felt a terrible pain, as though somebody had struck him a heavy blow on the head and neck. At the same time he felt an acute pain in the chest, as if a red-hot iron had been run in, and a weight pressed upon his heart and lungs.

HOW THE SNAKE'S POISON FROM A RAT'S BODY NEARLY KILLED A MAN

Buckland knew that he had been poisoned by the venom injected by the cobra into the rat.

He said to a friend who was with him, "Keep me going; take me to a druggist's." Poor Buckland became almost unconscious; but, with his friend's help, he managed to reach the druggist's, and to take down a bottle of hartshorn. Of this he drank a large quantity in a tumbler, with a little water added. It badly burnt his mouth and lips, but as he felt immediate relief he did not mind that. It saved his life. For weeks afterwards he was very ill, but in time he got better. It was only a mild attack of the poison which he had had to bear.

Of course it remains to be told how he managed to get poisoned at all. He had not touched the snake, and the poison is harmless unless it enters through a break in the skin. And that is just what had happened here. Before going to the Zoo, Buckland, in cleaning his nails with a sharp instrument, had forced a tiny part of the skin away from the place at which it joins the under part of the thumb-nail. It was that nail which he had used to scrape the skin of the rat where the snake's fangs had entered. And through that tiny crack in the skin of his hand the dreadful poison had entered, and nearly caused his death. The poison had been in the body of the rat, yet, passing by the small opening into the hand of the man, the least drop of it all but killed him.

EVERY YEAR SNAKES KILL ENOUGH PEOPLE TO MAKE A GOOD-SIZED TOWN

There are several sorts of cobras. India has two sorts, Java and Borneo have another sort, and Africa has three or four sorts. The giant cobra of India measures as much as 13 feet in length. The ordinary cobra averages about 6 feet in length, though specimens have been killed more than 7¼ feet long. The Egyptian asp, of which we read in the Bible, is a cobra, which has spread far over Africa.

The death-rate from snake-bite in British India alone varies from 18,000 to 22,000 a year, to say nothing of thousands of cattle killed in the same way. A cobra cannot eat a horse or a cow, but it can give it a bite sufficient to cause its death. The death-rate does not go down. In 1905 the number of persons killed by snakes in India was 21,797, but in 1906 rose to 22,854.

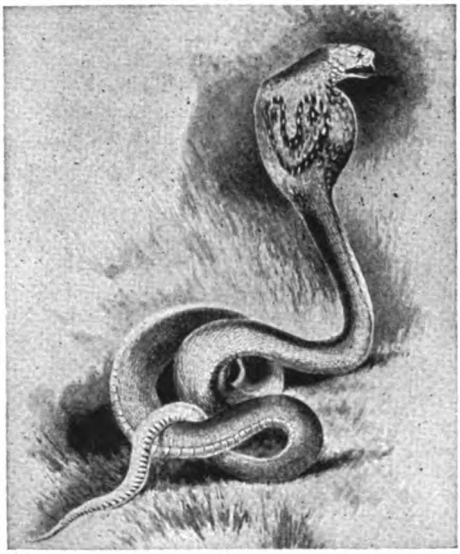
Thousands of snakes are killed every year, but not nearly as many as there should be. For a long time the British Government paid a reward for every snake killed in India. In 1880 over a quarter of a million were killed, and the number went on growing, until in 1889 the number slain was nearly 600,000 in the course of the year.

THE WICKED TRICK OF THE INDIAN SNAKE-CHARMER

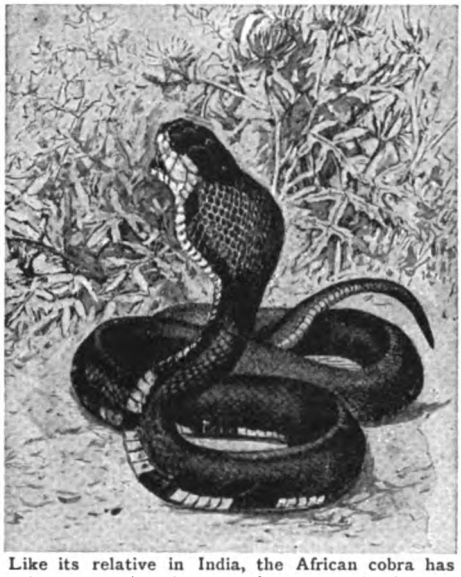
But wicked natives managed to keep poisonous snakes in order that they might breed, so enabling the men to kill a certain number and claim the reward for them.

That brings us to an interesting feature of Indian life. In many parts of the world natives worship snakes. They worship anything that is terrible, believing that if evil is powerful, we must be polite to it. They put up temples to cholera in some parts. Well, as many people worship serpents in

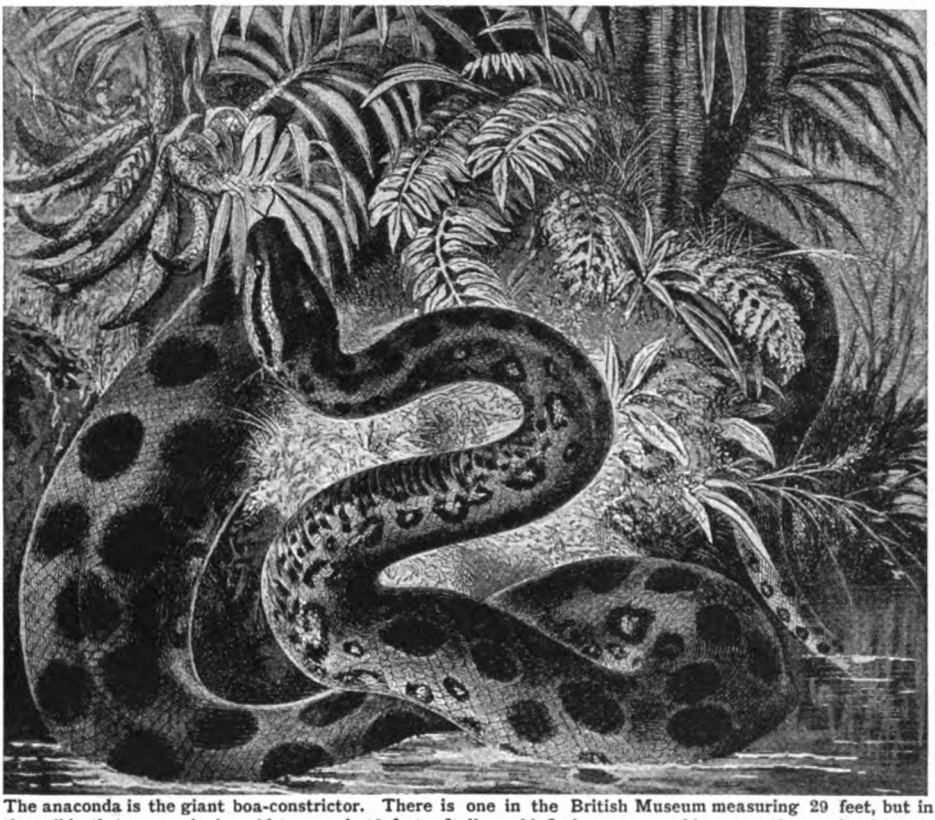
SNAKES THAT CAN KILL MEN INSTANTLY



The Indian cobra squeezes poison through holes in its two upper teeth into the flesh of its victim, and causes almost instant death to man or animal.



Like its relative in India, the African cobra has **only two teeth in its upper jaw, but each of these makes a wound, and then injects the deadliest poison.**



The anaconda is the giant boa-constrictor. There is one in the British Museum measuring 29 feet, but in the wilds the anaconda is said to reach 40 feet. It lives chiefly in water, and is not active on land, but it climbs trees with extraordinary speed and sureness. It is said to attack human beings when very hungry.

India, naturally they dare not have them killed. Clever, wicked men pretend to charm the deadly cobra. They say that by playing musical instruments they can charm a snake from its home.

What they really do is to produce a snake from their own garments, where they have secretly hidden it, and say that that is the wild one. They do not kill any of the snakes they show. Declaring that they have a charm which prevents the snake from killing them, they say that the charm would depart from them if they killed a cobra. "I will take this one away from you and release it in another jungle, far away," they say. They do exercise some sort of control over their own snakes, but it is the result of shameful cruelty.

When they catch a cobra they throw a cloth to it. The snake fixes its hooked teeth in this, and before it can draw them out the native gives a sharp tug at the cloth, and breaks off the poison fangs. The snake itself often breaks these, but they grow again very rapidly.

THE SNAKE THAT GREW NEW FANGS AND KILLED ITS KEEPER

Now, while the snake is defenceless, the native takes a red-hot iron and burns out the gland in which the poison is stored. After a burn such as this, flesh cannot grow again, so the poison cannot again collect. With the poison gone, though the teeth may grow, and though the snake will again and again bite its master, it cannot hurt him. This is the explanation of the so-called snake-charming of which we read.

Of course, the Indians always pretend that their snakes are deadly. They are the cleverest jugglers in the world, and can play all manner of tricks which the innocent do not detect. But sometimes they do not quite clear out the poison from the snake's mouth, and there comes a day when he is able to give a bite which kills the cruel pretender. This mistake once led to a death at a Zoo. Some snakes were brought there by a man who pretended that they were harmless, that he had mastered them. But after he had gone away the poison fangs grew again, and the poison gland was in full working order, and caused the death of one of the keepers of the snakes. As we all know, however, it is not only the largest snakes which are poisonous; some, as we have seen, which are very large are not poisonous. But there are deadly ones among the lesser snakes. The coral snakes are some of the handsomest of these. They live in America, Australia, Asia, and Africa, and though avoiding the homes of men, they are able to make very ill, or kill, any person they bite.

THE SNAKE THAT CREEPS INTO HOUSES IN INDIA

There is a rather similar snake, called the long-glanded snake, which ought to be even more terrible, for in this the poison gland is not confined to the mouth, but actually runs from the back of the head, along each side of the body for a third of its length. Happily, its total length is not much more than two feet. Closely related is the family of craits, which includes eight species of poisonous wretches, among them the banded adder of India, which is also called the king snake. The latter, though much to be feared—it can kill and eat a cobra—keeps clear of men. The ordinary crait, however, is the one which, next to the cobra, takes most lives in India. It creeps into houses, and the moment it is disturbed it gives its fatal bite.

New Zealand has no snakes, but Australia has enough and to spare. One of the most common is the horrid death adder. Although it feeds on frogs and young birds, it will savagely attack a man, and its name sufficiently tells its character. Many snakes live entirely, or nearly all their lives, in the water. Most of them prefer the fresh water of rivers, but others live in the sea. These are all poisonous, and woe betide the poor Hindu who ventures into the sea where they are seen to swarm. Their food is fish, but they will attack human beings.

THE ONLY SNAKE THAT ONE NEED FEAR IN GREAT BRITAIN

Europe has but one poisonous snake, the adder or viper; and this occurs in England. Otherwise England has only one common snake, which is much like the common American water-snake. It is called ringed or grass snake there. It is quite harmless, though it may attain a length of from 3 feet to 4 feet. It eats frogs, mice, young birds, and other little animals, and small fish. As it eats fish, it is plain that the grass

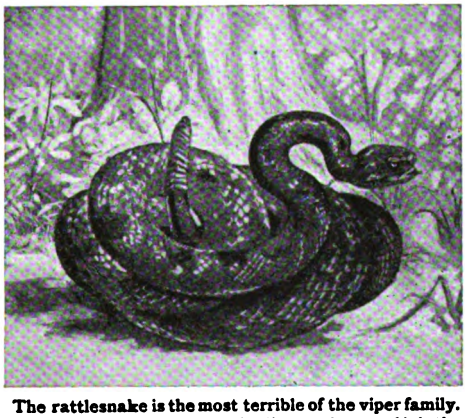
SNAKES THAT CLIMB TREES & HIDE IN SAND

The most handsome snakes are frequently the most venomous. This is true of the coral snake, seen here, which is one of the most beautiful, but very deadly.

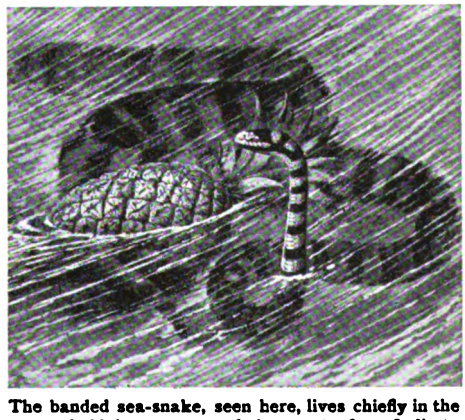
This new snake or grass snake is the only British serpent. It is quite harmless, eating insects, frogs, fish, birds and eggs, and swims well.

This horned viper is common in Egypt and other parts of Africa. Burying itself in sand, it leaves only its head visible, ready to bite. Its venom is deadly poison.

The puff-adder, here shown, can fill itself with air and look horrible. Savage huntsmen in Africa use its poison to tip arrows for killing men or animals.



The rattlesnake is the most terrible of the viper family. At the end of its tail is a bunch of horny rings, and it is the curious rattling of these that gives the snake its name.



The banded sea-snake, seen here, lives chiefly in the sea and tidal waters round the coasts from India to China. It has a broad tail, which enables it to swim fast.

snake must take to the water. It does. It is an excellent swimmer, and likes a great deal of water. Most snakes do. They would die without water, unless they could go to sleep. This does not apply, however, to the cobra, which can fast like a toad, and go for a long time without drinking. But let us go back to the English poison snake, the viper.

In England and Scotland, where it is fairly common, it likes dry heaths and waste places, hiding under stones and brushwood. Sometimes quite large ones are found, but, generally speaking, the viper does not exceed a length of about 24 inches. It eats frogs and birds, killing them with its poison, then swallowing them whole. The viper will not attack us if we do not first interfere with it. But one may touch it by accident; then it will strike with its fangs, and the result is a wound which causes great pain and swelling, followed often by a serious illness. The danger is that the viper may be taken for the harmless green snake. Once a boy, who caught a snake which had been robbing a nest, carried it home, and played with it while it was sleepy, believing it to be harmless. Suddenly it bit him, and for weeks afterwards he suffered greatly.

How the little wild Bushmen of Africa poison their arrows

It makes us fear the viper more to know to what a deadly family it belongs. The sand-viper of Europe, the chain-viper of India, which kills human beings and destroys cattle by biting them in the nose, and the horrible puff-adder of Africa, the ugly monster which, when angry, fills itself with air so that it swells visibly—these are some of our viper's relatives.

The puff-adder is interesting from the fact that it is its poison which the little wild bushmen of Africa use for their arrows. They are very small arrows, so small that they would not kill a deer. But when they prick the flesh they startle the deer, which, feeling the wound, runs away. By running, it causes the blood to spread the poison over its body. It soon falls dead. The hunters eat the flesh, and are not hurt by the poison.

Snakes have not much brain, but one of them, the horned viper of Egypt, a savage-looking snake, which has two short, sharp horns, has sense enough to know that, where a caravan has been, another will go. It curls itself up in the footprint of a camel, and waits for some other animal to pass, ready to shoot out and inflict a fatal wound. Bad as these are, we have yet to come to the most dreaded of vipers, the rattlesnake.

The mystery of the rattlesnake's wonderful tail

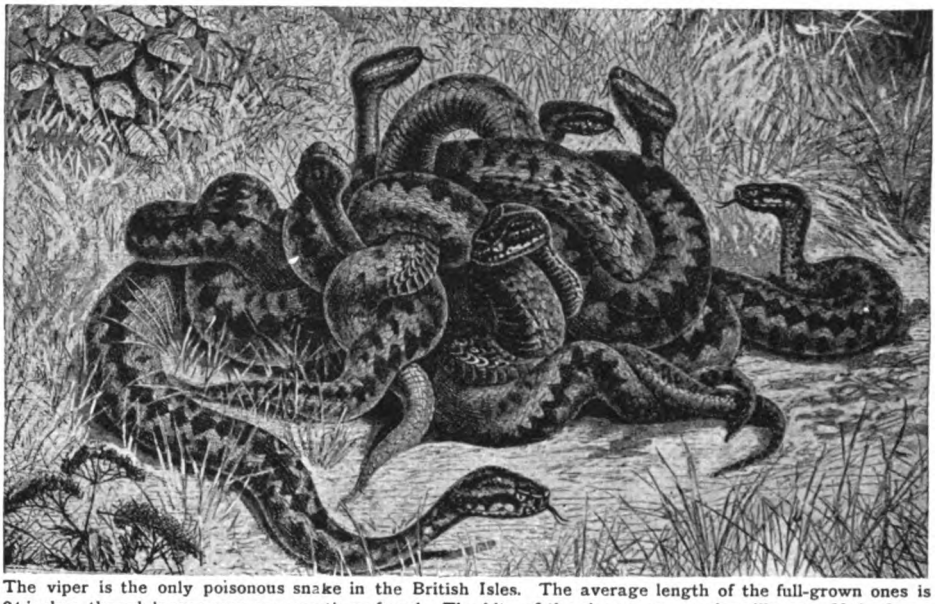
The rattlesnake is the head of a family of what are called pit-vipers. Not because they live in pits, but because they have a deep mark or pit on the head, do they have this name. Some live in Asia, but the most deadly are those of North America. The rattlesnake is not among the biggest of snakes, for it does not exceed 4 feet in length. Even so it is a fearful creature. One bite will paralyse a man. Its natural food consists of rabbits, rats, mice, frogs, and prairie dogs. We have read about the rattlesnake making its home with these little creatures.

The most curious part about this snake is its rattle. This, in an old snake, consists of about twenty round rings of a quill-like growth, loosely formed at the end of the tail. What purpose it serves nobody can say. Under excitement the rattle is raised and shaken. Animals know the sound and are afraid of it. Whether it is meant to terrify the prey of the rattlesnake and make them helpless, as the roar of the lion is meant to frighten the deer, or whether it is meant to drive away creatures with which it is too lazy to do battle, or whether it is the way of the rattlesnake for communicating with his fellows—we do not know. If a rattler shakes his tail, all his relatives in the neighbourhood shake theirs in answer.

Rattlesnakes that came together to sleep through the winter

Pigs have done a great deal towards keeping down the numbers of rattlesnakes. They do not seem to mind its bite, nor the bite of the deadly cobra. Though bitten two or three times, pigs munch away and enjoy the snake like the greatest dainty. But in days which living men can remember, rattlesnakes swarmed in certain parts of America. They used to collect in enormous numbers, and, coiled in masses, thousands of them would thus sleep the winter away. It is said that, in order thus to meet, some of the snakes

SNAKES THAT MEET FOR A WINTER'S SLEEP



The viper is the only poisonous snake in the British Isles. The average length of the full-grown ones is 24 inches, though larger ones are sometimes found. The bite of the viper causes serious illness. If the fangs touch the victim's neck, the wound may cause death by suffocation. In winter vipers gather together in numbers.

The ringed snake, seen in this picture, is harmless to men. It neither poisons nor crushes. It loves the water, where it catches frogs and other small water animals. These it seizes by the leg, then **swallows them whole.**

would have to travel twenty or thirty miles. It was a case of returning to their birthplace, and they went as surely as birds which migrate.

THE SNAKE WITH A MOUTH THAT WORKS IN TWO HALVES

All snakes have some features in common. They have not movable eyelids like lizards. They all change their skins frequently in the course of the year. They all have a skin covering to the eye to protect that organ from injury by thorns. But the most striking thing is the way in which their mouths are formed. The lower jaw, instead of being one bone as ours is, consists of two halves joined together at the chin by a tough muscle. The effect of that is that the snake, when eating, can grip with one side of its mouth, while the other is opened and moved forward.

When a snake seizes an animal with its teeth, it must hold on—it cannot afford to let go. Their teeth, of which there are three or four rows, all curve towards the throat, so that there is no escape, once an animal is seized. But, holding with one half of the jaw, the snake can, by moving first one side of the jaw, then the other, draw the animal down its throat.

The power of their jaws, throat, and body to stretch is wonderful. No snake can masticate its food ; it must swallow it whole. When the meal happens to be a sheep, or a small deer, or a big dog, we can understand that the stretch must be considerable. We do not know quite what the python can swallow. One is said to have been found dead with a full-grown goat inside it, its death having been caused by the animal's horns. On the other hand, it is said to be impossible for the boa to swallow anything bigger than a half-grown sheep, and this is nearer the truth.

HOW A BOA-CONSTRICTOR TRIED TO CRUSH AND EAT THE MAN WHO FED IT

That the boa-constrictor will *try* to eat men we have evidence.

Once when a man was about to feed a hungry boa with a chicken, the reptile, in darting for the fowl, missed it, and by mistake caught his hand. In an instant the terrible creature wound itself round his arm and neck and threw him down helpless. He could not move, but two other keepers rushed up, and by great exertions got the man away, but not until they had broken off the snake's teeth in the man's hand and so released him.

That gives us an idea of the power and ferocity of these monsters. Having once seized their victim, they fling their great coils round him, and by the most terrible power crush him, bones and all. A bear may hug, but it cannot hug like a great python can crush. Of course, they reach a great size. The Indian python grows to 30 feet, and the West African python to 25 feet, and their bodies are as thick as the thickest part of a man's leg.

The boa family includes the python, the anaconda, and the boa-constrictor proper. They all climb trees and can hang head downwards by the aid of tails, which, like those of the American monkeys, have gripping power. They show the rudiments of what once were hind legs. They are less feared than the poisonous snakes, because they will not, as a rule, attack men unless very hungry. One at a Zoo swallowed a rug, when waking after a long fast.

THE SNAKE THAT ATE ITS BED-FELLOW IN THE NIGHT

This reminds us that once the boa strikes its teeth into anything it must go on eating. There was an extraordinary example of this in 1894 at the London Zoo. In a cage were two boa-constrictors, one 11 feet long and the other a little over 9 feet long. The keeper put in a couple of pigeons overnight, and before he went away he saw the larger snake take one.

In the morning there remained only the larger snake, looking enormously swollen. The 9-feet snake had disappeared ; its mate had eaten it. This is the explanation : The larger snake, having eaten its own pigeon, saw the second pigeon sticking in the mouth of the smaller snake. It made a grab, but caught the head of the snake as well.

Its teeth became fixed, and it could not get the other snake out of its mouth. So it quietly settled down to make a meal of its bed-fellow, and when morning came there were two snakes in one. For 28 days the snake ate no more. Then it woke up, and, as if to show that its appetite was in no way injured, it ate a plump pigeon.

The next Nature Stories are on page 1423.

WHAT THIS STORY TELLS US

WE have been studying living cells that swim in water, and here we read about living cells that swim in our blood, and can live in a drop of blood apart from us for days. They help to make the blood the most wonderful fluid in the world. They give us our colour—we cannot blush without them or without the iron which makes them red. These cells are made inside our bones, and they carry the air we breathe from the lungs to every part of the body for its life. Then each cell, having given up its burden of oxygen, returns to the lungs for another load, and so on it goes, round and round, until in a few weeks it is worn out and dies, and a new cell from the bones takes its place. In a single drop of blood there are more of these cells than there are people in New York City.

THE RED CELLS OF THE BLOOD

CONTINUED FROM 1183

WE have been talking about living cells, which are the units of all living creatures, just as atoms are the units of the elements of matter. We have read of some of the simplest of these living cells, those which are complete creatures in themselves, such as microbes, the amœba found in ponds, and so on.

This prepares us now to study the most wonderful fluid in the world—the red blood which is found in the bodies of all the higher animals, and which we know so well in ourselves. Though we think of the blood as a fluid, it is really crammed with living cells, red and white, upon the health of which our own health depends.

In any case, we cannot know too much about the blood. Its health is our health. The number and life of the cells in it are urgent matters for us. We eat in order to keep its fluid part of proper composition, so that it shall be able to supply the right kind of nourishment to every part of our body—from the brain-cells down to the cells that make our nails.

The gaseous part of the blood is a matter of life and death for us. We breathe in order that its composition shall be kept right—in order that the poisonous gases produced by the body and carried by the blood shall be got rid of; and in order that the life-giving gas, oxygen, shall be supplied to it in proper quantity. All these three parts of the blood—the cells, the fluid, and the gases—are absolutely necessary for life. But here, since we have been lately talking about cells, we may begin with them. On the whole, we may say that these cells are of two kinds, known as the red cells and white cells.

The red cells are much the more numerous and the easiest to understand. In a volume of blood the size of about two pins' heads, there should be millions of these red cells. That will give us some idea of their tiny size. We could also count the number by taking a very small drop of blood, dropping it into a little well made in a glass plate, and covering it up and looking through the microscope. We know exactly how deep the well is, and the floor of it is ruled in both directions with tiny lines of which we know the distance apart.

So if we count the number of cells we see in each of these squares, we can reckon the richness of the blood in cells. This takes a very long time and is very difficult to do, especially as the blood has to be diluted first; but it is very well worth doing, both for the red cells and the white cells, because their number changes very much in different states of health, and very often the doctor knows how to treat a patient just because he is able to watch these changes in the number of cells in the blood.

All the colour of the blood is due to the red cells. When we look at a single

cell by itself, however, it is not really red, but yellow. It is the great number of them seen together that makes the blood look red.

When you prick your finger, the drop of blood should be of a rich red colour, but in people who are living unhealthy lives or who are not quite well the blood is often too pale, and these people suffer in many ways in consequence.

THE CELLS THAT MAKE OUR BLOOD RED, AND THE WAY IN WHICH THEY WORK

Breathing bad air is one of the chief causes of this paleness, for the bad gases in the air are poisons to the red cells, and kill many of them, so that their numbers may fall to perhaps much less than half of what they should be. Also the number of cells may be quite up to the mark, but they may not contain the right quantity of the yellow or red stuff which it is their business to carry about. The red cells are round and flat, and rather thinner towards the middle than towards the edge. When a thing is scooped out in the middle, it is said to be *concave*, and when it is scooped out on both sides it is said to be *bi-concave ;* if it is rather flat it is called a *disc*. So we say that red blood-cells are *circular bi-concave discs*. Indeed, in shape they are rather like the glasses which short-sighted people have to wear in spectacles.

When the blood is healthy the red cells are all of the same size and shape. We cannot see any nucleus in them. But each cell had a nucleus when it was younger. When they are grown up, so to say, they lose their nucleus ; they cannot divide into two, as many cells do, and they only live a short time in the blood—perhaps a few days or weeks. Then they are broken down and disposed of. This is going on all the time, and all the time new red cells are being poured into the blood.

THE LIVING PILLARS OF OUR BODY AND THE WONDER THAT WORKS INSIDE THEM

They are made inside our bones. This is one of the astonishing things which many people find it hard to believe ; they think of bones as hard, dead things which exist merely for the same reason as the pillars of a building.

But these are living pillars, and the inside of them is filled with stuff called marrow, which is not only alive, but one of the most alive and most active tissues in the whole body. The cells in this red bone-marrow, as it is called, have the amazing power of making the red cells, which the blood picks up as it pours through the bones, and which keep it always freshly supplied with cells ; unless, indeed, the red bone-marrow falls ill, as it sometimes does. I think there is nothing, perhaps, which upsets the red bone-marrow so certainly as having to breathe impure gases brought to it by the blood because we have been breathing foul air.

As the blood flows in our bodies, the red cells are whirled along with it, but they do not move of themselves ; they are very passive things, as different as can be from the white cells. They do not change their shape ; indeed, they seem to have an elastic covering which prevents them from doing so. They never eat up a microbe or an enemy in the blood. Sometimes we do see microbes in them, but that is because the microbes have killed the cells, not because the cells have eaten the microbes.

THE LITTLE CARRIERS OF HÆMOGLOBIN, THE COLOURING MATTER IN OUR BLOOD

What, then, is the use of the red cells which exist in such billions and billions in our blood ? The answer is that their use is simply as vehicles, as carriers of the precious colouring matter they contain. This yellow or red matter has a long name, but it is so important that we must try to learn it.

Its name is *hæmoglobin*—the first half of this word is simply the Greek for blood. Hæmoglobin is probably the most remarkable chemical compound in the whole world. It is believed also to be much the most complicated. Indeed, the various compounds that we get when we split it up are themselves quite as complicated as any other compounds we know. We have learned in another part of this book that such a compound as water consists of molecules, each of which is made of three atoms. It is probable that there are at least a thousand atoms in every molecule of hæmoglobin. They are mostly atoms of carbon, hydrogen, nitrogen, and oxygen, but one of them—and it is absolutely necessary—is an atom of the metal iron.

So hæmoglobin follows the rule that the compounds of iron are usually coloured. It is interesting to remember that, just as iron is necessary for the

most important coloured compound in the animal body, so iron is always found in the most important coloured compound in the vegetable body.

THE IRON THAT MAKES BLOOD RED AND GRASS GREEN

That is to say, iron is one of the things that help to make colour in the world—not only the red in our blood, but the green colouring matter of leaves. It may be, then, that very humble forms of life can exist without iron, but at any rate we are certain that iron is necessary for all the life of higher animals and plants. This tells us something about our food, too. The red cells, we learned, die, and are broken up after a time, and their iron is lost. Iron is therefore a necessary part of our food; we should die without it. And perhaps it is interesting to know that the foods which contain iron, and from which we get it, include the best of all our foods, such as milk, eggs, bread, meat, potatoes, peas, rice, and oatmeal. The wines which are supposed to be rich in iron, and used to be ordered for this purpose, contain extremely little—nothing like so much as is found in these common foods; and when anyone's blood is poor in iron, milk is worth all the wine in the world for him.

But we have not yet said why this hæmoglobin should be so important. We know that it is important, since our bones are filled with material for making it, and since the blood is crammed with cells to carry it, and since we fall ill at once if the amount of it in our blood falls below the proper quantity.

HÆMOGLOBIN CARRIES THE OXYGEN TO EVERY PART OF THE BODY

It must have some great use, then, and it certainly has, for it is this hæmoglobin that carries the oxygen, which we get from the air when we breathe, to every part of the body. We have learned that every living cell must breathe or die; every living cell of the body must get oxygen or die, and the only way in which it can get this oxygen is through the blood, and the only way in which the blood can supply it is by means of this hæmoglobin. Now, what we have already learned will help us to understand what hæmoglobin does.

We must understand, in the first place, that the blood is always circulating through the body, and in the course of doing so it passes through the lungs. Every few minutes—some say four minutes—every red cell in the blood passes through the lungs, and after doing so it goes to various parts of the body, and so on, again and again, until its life is ended and a younger cell takes its place. The whole meaning of its passing through the lungs is that there it finds oxygen. Perhaps it also finds many foul gases which injure it. But that is not its fault, but ours. It is to get oxgyen that it goes to the lungs, and if we there expose it to poisons which we have breathed by our foolishness, so much the worse for the red cell, and for us, whom it is trying to serve.

Now, the special point to note is this: that the fluid part of the blood, and the white cells of the blood, cannot take up, as they pass through the lungs, anything like sufficient oxygen for the needs of the body. It is only the red cells that can do this, and it is only because of the hæmoglobin in them that they can do it.

WHAT GOES TO THE LUNGS WHEN WE BREATHE

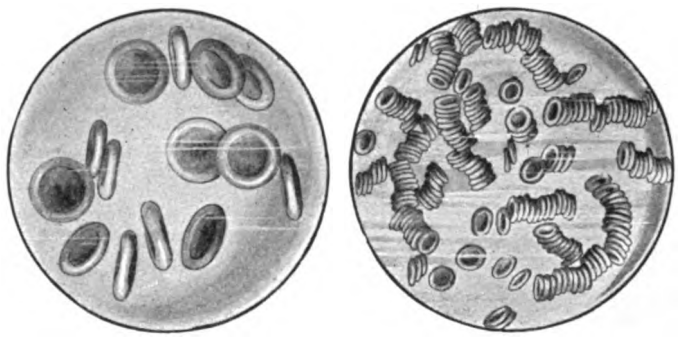
Sometimes there are plenty of them, but they do not contain enough hæmoglobin, and then we suffer. Each molecule of hæmoglobin has the power of combining with itself a molecule of oxygen. Now, no one knows the exact composition of hæmoglobin, but let us, for convenience, give it a name of its own, Hb. We cannot call it H, because we know that that stands for hydrogen. Now, a molecule of oxygen will be represented by O_2. Well, when blood passes through the lungs, all the Hb of the red cells combines with the O_2 in the lungs, and makes a compound which we can call HbO_2. This is simply hæmoglobin and oxygen, and the long name for it is oxyhæmoglobin. In contrast with this, we sometimes call hæmoglobin, when it is not combined with a molecule of oxygen, or when that molecule of oxygen has been taken away from it, *reduced* hæmoglobin. We remember that when oxygen is taken from anything, that thing is said to be reduced.

What comes to the lungs, then, is reduced or simple hæmoglobin—Hb; what leaves the lungs is HbO_2. This makes a remarkable difference of colour in the blood, for HbO_2 has a bright and cheerful red colour—the colour of life, as it has been called; while Hb itself

has a much darker and more sullen colour. We can see the difference at once in anyone who has a choking fit, for his skin becomes dark and purple. All the blood in it is full of Hb instead of HbO_2, because he is not getting air into his lungs. When he gets right again the healthy colour will return, owing to the air getting into his lungs, and the blood in his skin has plenty of HbO_2 in it instead of having only Hb.

LOOK AT THE BACK OF YOUR HAND AND SEE THE BLOOD RUNNING

If you look at the back of your hand or at the front of your wrist you will see little blue lines. These are veins, and the blood in them is running up the arm. You can tell that it is doing so, for if you hang your arm down and run your finger firmly along one of these veins, say, on the back of your hand, running your finger downwards towards the fingers, the blue line disappears. Then, if you take your finger off, you can see the blood run upwards and fill the vein again. The vein looks bluish through the skin because the colouring matter in the red cells of the blood is of the dark kind; it is Hb, not HbO_2; and this blood is rushing back up your arm as fast as it can in order to get to the lungs, where it will find fresh oxygen which you are breathing in to get ready for it at this moment; and there the Hb will be made into HbO_2, and the dark blood will turn bright again. This bright blood returns to the heart, and is pumped by it to every part of the body, where its business is to give up its oxygen so that the HbO_2 is reduced to Hb again, which is sent back to the lungs for more oxygen, and so on.



These pictures show us what the red cells of the blood are like, very much enlarged. The tiniest drop of blood appears like this under the microscope, with more of these cells than there are people in Chicago. As they die the red cells move and string themselves together like beads, as in the second picture.

The most wonderful thing about hæmoglobin, then, is its power of picking up oxygen very easily, on the one hand, and of giving it away again very easily, on the other hand, wherever it is required. That is the whole duty and purpose of these countless red cells in our blood.

If we are to be well and strong, and useful and happy, we must have a sufficient supply of red cells in our blood, and they must contain sufficient hæmoglobin. So we must avoid anything that poisons them, or that poisons the bone marrow which makes them, and so prevents it from supplying them to the blood quickly enough. I think that bad air is much the most important of poisons we are at all likely to meet in this country. But in great areas of the world much the most serious poison of the red blood cells is the tiny living creature which causes the disease malaria. Certain kinds of mosquitoes carry this creature, and, when they bite us, pass it into the blood, where it kills many of the red cells. We are beginning to abolish this disease by killing the mosquitoes that carry it.

WHY IT IS THAT MEN DIE IF THEY SWALLOW POISON

The action of many poisons is due to the fact that they interfere with the work done by hæmoglobin. Prussic acid, for instance, unites with the hæmoglobin in the blood so that it can no longer take up oxygen, and a person poisoned with prussic acid therefore dies of a kind of suffocation. The blood passing through his lungs cannot pick up the oxygen in them. Alcohol also has a very interesting action on the red cells. Somehow or other it makes the union of hæmoglobin with oxygen much more stable than it usually is. The consequence is that it is not reduced by the tissues of the body as quickly as should be. They are thus not burnt up so well, and this is one of the reasons why people who take too much alcohol are apt to get stout. No one knows why alcohol does this.

The next part of this is on page 1441.

THE HISTORY OF OUR LAND

George Washington delivering his first address as President of the United States

BUILDING THE NEW NATION

CONTINUED FROM PAGE 992

WE have already read that Cornwallis surrendered his whole army to the combined French and American armies at Yorktown on October 19th, 1781; and that everybody except King George III felt that the colonies must have their independence. He was stubborn, however, and peace was not made at once. He even declared, after he had been shown that the British could not conquer the colonies, that, at least, the state of Georgia and the cities of New York and Charleston, which were held by British troops, must be kept. General Wayne soon drove the British army out of Georgia, and the Spaniards took Florida, and the obstinate king was forced to agree to a peace.

SPAIN AND FRANCE WISH THE TERRITORY OF THE UNITED STATES KEPT SMALL

This peace was not made at once for the interests of Spain and France had to be considered. The chief reason France helped the colonies was the hope of harming England, and the French government did not wish to see the new American nation become too powerful. So the chief minister suggested that all the country between the Mississippi and the Ohio rivers — now Ohio, Indiana, Illinois and the states north of them — should remain an English possession. The country south of the Ohio and east of the Mississippi, — now the states of Kentucky, Tennessee, Alabama and Mississippi, — should be Indian territory, a part under protection of the United States, and a part under Spain. As Spain controlled Florida this plan would have given the thirteen states no room to grow.

The Americans who had been sent over to make peace would not agree to such a plan, and at last, November 30th, 1782, a treaty was agreed upon, though it was not signed until September 3d, 1783. This treaty gave to the United States all territory held by England east of the Mississippi River, and gave the priv-

ilege of catching fish on the coast of Newfoundland. On the other hand the United States agreed that all debts due British merchants must be paid and that Congress would recommend to the states that they should not pass harsh laws against those Tories who had not been active against the American cause.

THE TORIES ARE HARSHLY TREATED AFTER THE WAR

The states did not pay much attention to these recommendations, and many Tories left when the British troops sailed away. Many others were forced to go later, and some historians say that about 100,000 in all left the colonies. Some of these were bad men who had done much harm to their neighbours. Others had honestly believed that Parliament was in the right and during the Revolution had gone about their business. The colonies needed population so badly that it seems a great pity that the good as well as the bad Tories were forced to leave.

WASHINGTON RESIGNS AND RETURNS TO HIS HOME

As soon as it was certain that peace had been made, the army which had been in camp near Newburgh, New York was disbanded November 3rd, 1783. On December 4th, Washington met his officers in Fraunces's Tavern, which is now owned by the City of New York. After bidding them farewell he was rowed across the Hudson to New Jersey as we see in the picture on page 993. When he reached Philadelphia, he handed to the proper officer, a statement of the money he had spent out of his own pocket after he took command of the army in Cambridge, more than eight years before. The amount was $64,315. For his services during that time he refused to receive any pay. When he reached Annapolis, Maryland, where Congress was then sitting, he resigned as commander of the army and hurried away to spend Christmas at Mount Vernon. He had seen his home but once during the whole eight and a half years, and was anxious once more to devote his time to his family, his slaves and his lands. We shall see, however, that he was not long allowed to remain at his beautiful home.

Now that the colonies had become independent states, what sort of government did they have? You remember that in the beginning of the Revolution, delegates from the states met and called themselves the Continental Congress. This body raised an army, borrowed money and conducted the war, but no one could say how many or how few its rights were. Soon men began to feel the need of some sort of union, and a committee drew up a paper called the Articles of Confederation. Congress adopted them in November, 1777, and sent them to the states to be adopted or rejected. The states were very slow and not until March, 1781, — when the Revolution was almost over, — did all the states agree.

WHAT WERE THE ARTICLES OF CONFEDERATION

In order to understand our government now, we must understand what sort of a government we had under the Articles of Confederation. The states kept nearly all the power and the Confederation had little. Now we all know that the United States is above any one state, but it was not so then. There was no president. Each state sent not less than two and not more than seven delegates to Congress, and each state whether large or small, had one vote. If a state had two, four, or six delegates present and half were on one side and half on the other, the state lost its vote. No law could be made unless nine states voted in favour of it, and so very few laws were made.

Congress was given power to raise an army and build a navy, but was given no power to raise money to pay for them. It could only recommend that each state pay its part of the money needed. The states were jealous of one another and very often refused to pay what was asked, saying that the amount was more than their share, and Congress could

not make them pay. Now a government which has not the power to raise money is almost the same as no government at all.

After peace was made conditions grew worse. During the war the danger made the states agree sometimes. When the war was ended, they quarrelled all the time. The army was not paid, and some of the officers wished to make Washington king. In Massachusetts, there was a little war known as Shays' Rebellion and in other states men refused to obey the state laws.

More curious ideas about trade

Now every state and every city is glad to get as much trade as possible. Then the old ideas of trade about which you have been told on page 978 were believed. The people in New York thought that because people from Connecticut and New Jersey sold wood and food in New York City, that they were enemies who carried off the money from the city. So they laid heavy taxes on everything coming from those states, and those states in revenge refused to trade with New York at all. Then too the territory west of the Alleghany Mountains was claimed by several states and they quarrelled about that.

Truly the United States was "one nation today and thirteen tomorrow." The wisest men began to despair. There was danger that civil war would break out, and then one by one, the states would be brought under the power of England or of Spain, for the latter nation was hoping to join Georgia and South Carolina to Florida, and had also refused to allow American boats to float down the Mississippi into the Gulf of Mexico.

It was seen that something must be done quickly, and early in 1787, Congress decided that a convention to change the Articles of Confederation should be held. The convention met in May, 1787, in Philadelphia, in the same room where the Declaration of Independence had been signed. Many great men were members and Washington was chosen to preside over the meetings. Some of the other members were Benjamin Franklin, James Madison and Alexander Hamilton. They had met to patch up the old confederation but at once they began to talk about a new form of government in which the people instead of the states should rule.

The attempt to form a stronger government

At once the delegates were divided into a small state and a large state party. Virginia then had the largest population, and she felt it unfair that her population and size should give her no more voice than Dela are, Rhode Island or New Hampshire. The small states feared that the large states would oppress them and said that the old plan of one vote for every state must be continued. Finally it was agreed that Congress should be made up of two branches. In the one, called the Senate, each state, whether large or small, should have two members. In the other, called the House of Representatives, the states were to have members according to their population.

Then the delegates disputed about the powers that Congress should have. Some did not want a strong central government; others wished a monarchy or something very like it. One man said that the old state lines ought to be wiped out and thirteen new states of equal size ought to be made. The farming states wanted one thing, the shipbuilding states, another. The slaveholding states had one idea; the states where there were few or no slaves had another. Some wished a president to hold office for life; others wished the office to be held by a committee of seven.

The constitution is finally adopted

At last, after four months of discussion, the Constitution was adopted and sent by Congress to the states to be voted on, with the agreement

that the new government would begin when nine states had agreed. It is said that Franklin, when the convention broke up, pointed to a picture of the sun in the hall and said "As I have been sitting here all these weeks, I have often wondered whether yonder sun is rising or setting. But now I know that it is a rising sun."

When the Constitution was sent to the states, many prominent men tried to get the different states to vote against it. Patrick Henry and Samuel Adams, who had done so much to bring on the Revolution worked against it because they were afraid that it took too much power away from the states. They and many others feared that the president would become a tyrant. But the friends of the new form of government were too strong. Delaware first approved and was followed by Pennsylvania, New Jersey and then by all the other states except North Carolina and Rhode Island. These two states did not join the new union until the government was well begun.

A PRESIDENT IS ELECTED

When the time came to elect a president, there was only one choice for the head of the new nation. Washington was again called from Mount Vernon to serve his country. He was supposed to begin his administration on the first Wednesday in March, 1789, but not until April 30th, 1789, was everything ready. On that day he took the oath of office on the balcony of Federal Hall in New York City. The building was long ago torn down, but, almost on the exact spot, on Wall Street today, you may see a bronze statue of the "Father of his Country," and in the City Hall is much of the furniture used by the first officers of our government. John Adams of Massachusetts became vice-president.

We are proud of the size, the wealth, and the population of our country today, but it was a very poor and weak nation then. The population was about four millions of people — no more than live now in the single city of New York. Not more than 100,000 lived west of the Alleghany Mountains, where great herds of buffalo roamed the plains and the Indians hid in the woods to attack the scattered pioneers. Most of the people got their living by farming or fishing, though cotton manufacturing was just beginning, and a few iron foundries existed. Molasses brought from the West Indies was made into rum, and on every farm was a spinning wheel and a loom. Small ships were built in New England from which to fish, or with which to trade with the West Indies. For the most part the young nation depended upon Europe for its manufactures.

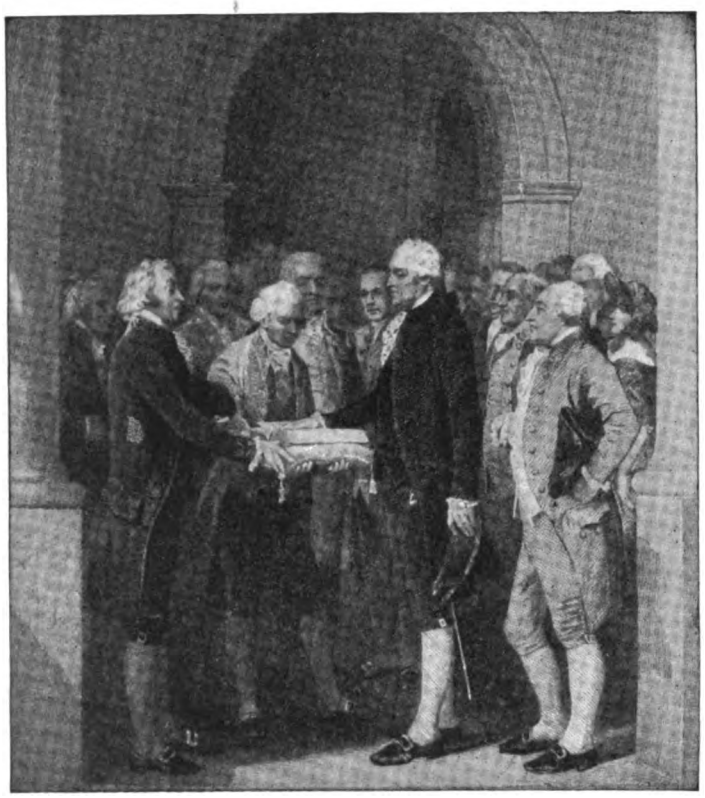
THE UNITED STATES IN WASHINGTON'S TIME

Railroads, telegraphs, telephones, gas, electric lights, and matches were unknown. People travelled from place to place on horseback, in carriages, by boat or by stages. These last named took a week to go from Boston to New York, if they did not stick in the mud. We can now travel the distance in five hours, and can go from New York to Berlin more quickly than Washington could go from Mt. Vernon to New York. Candles were generally used for lighting at this time and even much later. Fire was usually made by striking a flint stone with a piece of steel. Coal was hardly used at all.

Only four or five towns deserved the name of city at all. Boston and New York were unpaved, unlighted towns in the streets of which the cattle and pigs moved at will. Philadelphia was the largest town, and was noted for its paved sidewalks and its fine houses. Charleston was an important port and ships from England came for the rice and indigo bringing with them manufactured goods of every kind. Baltimore was smaller, but was prosperous, and had one fine street.

The life of the farmer and of the farmer's wife was hard. There was

THE BEGINNING OF THE GOVERNMENT OF THE NEW NATION



On April 30th, 1789, George Washington was inaugurated President of the United States at Federal Hall, on Wall Street, New York City. The Sub-Treasury, with its fine statue of the first president, now occupies the spot. The second picture shows his first advisers. Henry Knox, Secretary of War, is seated; next stands Thomas Jefferson, Secretary of State, and to Washington's right is Alexander Hamilton, Secretary of the Treasury. These were the only cabinet officers at first.

no machinery to save labour, such as we now see on almost every farm. Everything was done by hand. The farmer's wife took care of the house, spun yarn, wove cloth, and made the clothes for the family, knit stockings, made soap and candles, looked after the milk and butter, cured the meat, made sausages, and did hundreds of other things, helped by her daughters. The sons helped the father on the farm. Often the father tanned the hides of the cattle and made the family shoes from the leather. He was often forced to be a carpenter and a blacksmith as well as a farmer.

There were few newspapers and we should think them very poor. They were small, badly printed, and had few readers. Books were scarce and high in price. Even lawyers and doctors had very few. Mails were slow and seldom arrived in time. Often a letter took weeks to make a trip now made in hours. The people in one state knew little of those in another, and sometimes people in different parts of the same state were entire strangers. We know now more about what happens in Japan or India than the Georgian knew about what happened in Connecticut.

Some fine houses in the country

Very little attention was given to music, literature, art or architecture, though there were some fine private houses filled with furniture, silver and china brought from Europe. The houses were heated by great fireplaces and had none of our modern conveniences such as running water, bath-tubs or cooking stoves.

Many of our common vegetables such as the tomato, the cauliflower and the egg plant were unknown. Apples and pears were small and not very good, while the only strawberries or raspberries were those which grew wild. Ice was kept only by the wealthy, who built private ice-houses. Our modern way of preserving the flavour of fruits and vegetables by putting them into tin or glass was not used then, but they were dried in the sun.

Such was the country over which Washington was chosen president. His work was not easy. The Congress had borrowed much money which it could not pay, and no one would trust the new government. Money had to be found to pay these debts and to pay the officers of the government. The people did not believe in keeping an army in time of peace but all knew that we must have a small force to keep the Indians in order. A navy was also necessary, but armies and navies cannot be kept up without money.

How money was found to run the government

Washington chose as Secretary of the Treasury—as the officer in charge of the money affairs of our government is called — the young Alexander Hamilton about whom you have read. This young man knew his business and got Congress to lay a small tax on goods from abroad. The colonists had opposed such taxes when laid by Great Britain but now they made no objection and soon the treasury had money enough.

Such a tax is called a tariff or an import duty. It is called an indirect tax because people pay it without knowing it. The merchant who brought in the foreign goods paid the tax first. Then he added the tax and his profit to the price of the goods. The people who bought the goods could not know how much of the price they paid was the cost of the manufacture, how much was cost of bringing from abroad, how much was tax, and how much was profit, and so they did not object.

If Hamilton had persuaded Congress to tax every house, every farm, and all other property, that would have been a direct tax because it was collected directly from the owner of the property. Some of the states might have forbidden their citizens to pay such a tax, and the Union might have been broken up. He did cause a small direct tax to be placed on whiskey, and some people in

Here is the interior of one of the homes of which we speak in the text. There were many houses in Virginia equal in every respect to this. Notice the solidly built furniture and the general air of comfort. Towns were few and company was so much valued that a servant was often sent to the taverns to request strangers to come to spend the night.

This picture of Sunday at Old Bruton Church at Williamsburg, Virginia, shows the dress and manners of the times of which our article treats. Notice the powdered hair, the cocked hats and ceremonious manners of the gentlemen. Williamsburg was once the capital of Virginia, and George Washington, Thomas Jefferson, Patrick Henry, Richard Henry Lee, and many other famous men attended service here.

Photograph, by Underwood & Underwood, New York.

Pennsylvania refused to pay it. But Washington called out troops and the people gave in and agreed to pay the tax.

WE HAVE TROUBLE WITH ENGLAND AND FRANCE

In another part of our book, you may read of the French Revolution which began in 1789. Many of our citizens sympathised with France. They said that the French had helped us in the Revolution, that they had established a republic like ours, and because of this fact they were at war with England. England was our enemy too, for she still kept soldiers in some forts on American soil, and her warships stopped American vessels to look for English sailors. For these reasons they said that we ought to help France even if it brought another war with England.

Washington knew that we were not yet strong enough to fight England again, and besides he felt that in France the Revolution was going too far. So he declared, in 1793, that the United States would remain neutral, which meant that we would take neither side. We made no friends by this plan, for both France and England captured our ships if they were sailing to the other country. England captured more of them because she had more warships, and it took all of Washington's strength to keep Congress from declaring war against that country, but he succeeded. He knew that we were growing stronger every year, but that if we fought with England again we could get no help from Europe, and we would be almost sure to lose our independence.

POLITICAL PARTIES BEGIN IN THE UNITED STATES

During Washington's first term there had been no political parties in the country, but during his second, which began in 1793, the people began to divide. One party, led by Hamilton and John Adams, wished a very strong central government. They did not believe in the rule of the people but thought that only the wealthy and the well-educated should have a voice. Thomas Jefferson said that the best government was that which governed least, and that all the people were more likely to be right than a few, no matter how rich and well-educated they were. The followers of Hamilton were called Federalists and those of Jefferson were first called Republicans, but later were called Democrats.

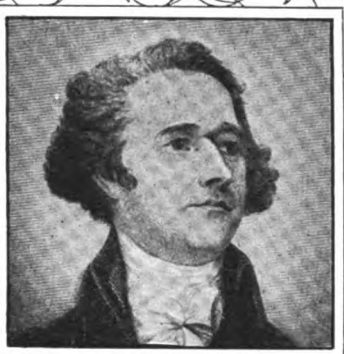
Washington tried hard to keep the peace between these parties but found it hard work. When his second term was almost over he declared that he would not serve a third term though a great majority of the people wished him to continue in office. At the election the vote between Adams and Jefferson was very close, but Adams was chosen.

"MILLIONS FOR DEFENCE BUT NOT ONE CENT FOR TRIBUTE"

Adams was not popular in France and that country did not like his election. Then too the French were angry because we had made a treaty with England instead of fighting. So they began to capture our ships, and when we objected, our representatives in France were told privately that if we would bribe some French ministers, our vessels would not be captured. When this base offer became known in this country it was reported that Charles C. Pinckney, one of our representatives, had said, "Millions for defence, but not one cent for tribute." The people were much excited, an army was raised, Washington was made commander and some warships were built which captured some French vessels. When France found that the United States would fight, she became quite willing to make peace.

The remainder of Adams's administration was full of trouble. Some foolish laws were made. One gave the president power to send any foreigner out of the country without a trial, or else to put him in prison. Another punished anyone who opposed the government or who published anything which was thought to make people think less of the officers. These laws, called

SOME BUILDERS OF THE NEW NATION



HAMILTON

JEFFERSON

MADISON

ADAMS

PINCKNEY

CLINTON

The chief builder of the nation was, of course, Washington, of whom we have shown many pictures. These are not all who had a share, but they were all important. The firmness of John Adams gained a favourable treaty of peace from England, while Hamilton's skill in money affairs put the nation on its feet. We have said much about Jefferson. Charles Cotesworth Pinckney was prominent in his day. Madison was our fourth president. DeWitt Clinton built the Erie Canal, of which we shall hear more.

the Alien and Sedition Laws, were so unpopular that Adams was not given a second term, but Jefferson was elected in his stead.

THE PURCHASE OF LOUISIANA DOUBLES THE SIZE OF OUR COUNTRY

The most important event during the eight years Jefferson was president was the purchase of Louisiana. You were told on page 886 how France gave to Spain in 1763 all the territory she claimed west of the Mississippi River. In 1801 Spain gave it back to France as Napoleon had a dream of founding a new French nation in the New World. He soon saw that the English fleet could destroy any colony he might plant, and besides he needed the money for his wars. So he sold the whole territory, which was greater in size than the United States at that time, for $15,000,000. From it thirteen states, or parts of states, have been made. Some of them, as Iowa and Missouri, are now among the richest and most prosperous states of the Union.

There were only about 40,000 people in this great territory, and many prominent men thought that it would be hundreds of years before it would have many settlers. Some men advised the New England states to secede, that is, to leave the Union, if the territory was taken by the United States. Only nine years later (1812) a small part of the territory was admitted to the Union as the state of Louisiana, and in 1821, another part became the state of Missouri. A hundred years after the purchase, the population of the whole territory was more than 15,000,000, and the value of the crops raised and the goods manufactured every year was more than two hundred times as much as the whole price paid.

WE GAIN A CLAIM TO LAND ON THE PACIFIC COAST

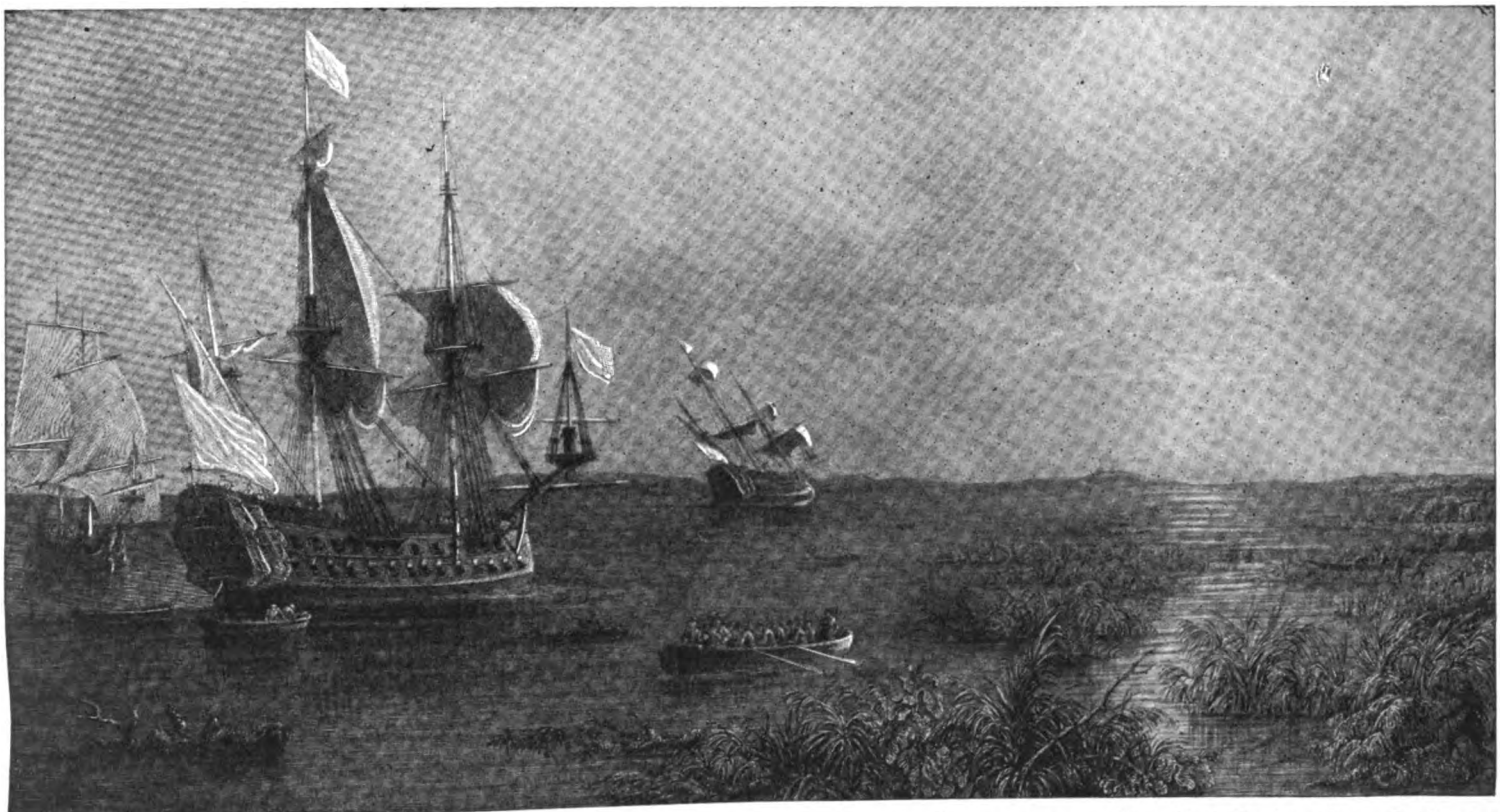
Little was then known of the Pacific coast. In 1792 Captain Robert Gray had sailed into a great river, which he called Columbia after his ship, and the country around was generally called Oregon, but very little was known about it. Jefferson determined to send William Clark and Meriwether Lewis to explore. Before they started Louisiana was bought. The expedition left St. Louis in 1804, went 1600 miles up the Missouri River before winter set in, and the next spring went on until the river grew so small that a man could step across it. They then crossed the Rocky Mountains and found another river which they followed to its mouth where Captain Gray had entered. No white men had ever made this trip before them, and their exploration helped the United States to claim Oregon when the dispute arose with Great Britain many years afterward.

FRANCE AND ENGLAND BOTH PREY UPON US

During the years of Jefferson's administration, England was trying to crush Napoleon, who had conquered most of Europe. England declared all seaports in Napoleon's power to be blockaded, that is, closed against vessels from any other nation, and Napoleon answered by declaring all British ports blockaded. The United States had many merchant ships which traded with Europe, and both France and England began to capture them if they were sailing toward the ports of the other nation, just as they had done during Adams's administration. In 1807, one hundred and ninety-four of our vessels were captured by England, and many by the French. Besides, England stopped our ships to look for sailors who had deserted, and sometimes took men born in the United States.

Jefferson tried hard to avoid war, for he felt that we were not yet strong enough to fight, and tried to punish both countries by getting Congress to pass laws forbidding our ships to trade with either country. While these laws hurt France and England, they hurt our own country more, and caused Jefferson to lose some of his popularity, but a majority of the people wanted him to serve a third term. He followed Washington's ex-

A FRENCH FLEET SEARCHES IN VAIN FOR LOUISIANA



After La Salle had floated down the Mississippi River in 1682, and called the country Louisiana, he went to France to get men and supplies to found a colony. On his return he could not find the mouth of the river. Here we see his ships in the Gulf of Mexico, seeking to find again the land which was to be taken away from France, regained, and finally to be sold and become a part of the United States.

ample and refused, and it has grown to be the custom to elect no president to serve more than two terms of four years each.

A FORMER VICE-PRESIDENT IS THROWN INTO PRISON

During Jefferson's administration the country increased rapidly in population and wealth. In 1807, Robert Fulton, of whom you may read in another place, ran his steamboat, the Clermont, on the Hudson River, and soon such boats were on all our rivers. A sad event was the death of Alexander Hamilton, who was killed in a duel in 1804, by Aaron Burr, then the vice-president. Later Burr had a plan to set up a monarchy in the West, but the plan failed, and the man who had been the second highest officer in our government was thrown into the common jail in Richmond while awaiting trial.

WHY VIRGINIA IS CALLED THE "MOTHER OF PRESIDENTS"

Our next president was James Madison, also a Virginian. In fact, during the first thirty-six years of our government, Virginia furnished the presidents for thirty-two, and so came to be called the "Mother of the Presidents." Madison was one of the ablest and one of the best men who have ever been president, but he came into office at a hard time. Both England and France were capturing our ships, and the Indians west of the Alleghanies were murdering the settlers, who were moving westward in large numbers.

Though Madison loved peace as much as Washington or Jefferson, the idea of war with England had become popular. The western people hoped to capture Canada and add it to the Union. They could not see the difficulties in the way, and, in 1812, war was declared. In the Constitution we declared that a foreigner could become an American citizen after a term of years. England said, "Once an Englishman, always an Englishman." She claimed, therefore, that a man born in England was a British subject, though he might have lived in the United States twenty years and be a citizen, or even an office-holder.

Four reasons for declaring war were given. (1) England had stirred up the Indians in the West. (2) She had captured 900 of our merchant ships in ten years. (3) She had blockaded our coasts. (4) She stopped our ships and impressed, that is, took off by force, our seamen, pretending that they were British deserters.

We then had about eight million people; England had twenty million. We had twelve ships with 4,000 sailors and 1,500 marines; England had 830 ships and 150,000 sailors. Two hundred and thirty of her ships were larger than any of ours. Our army was small, while England had many thousand trained soldiers. Most of them, however, were occupied against Napoleon at this time. Worse than all our other weaknesses was the fact that New England did not want to fight. The profits of shipbuilding and trading were so great that New Englanders felt that they could better afford to have some ships captured than to go into a war and have their trade cut off.

THE AMERICAN SHIPS AND SAILORS ASTONISH THE BRITISH

Two attempts to invade Canada failed, and the British captured Detroit, because the American officers were cowardly or were poor commanders. But on the sea the result was different. The American frigate, Essex, captured the Alert. Another American frigate, the Constitution, began, a few days later, her wonderful career by making a wreck of the British Guerrière in half an hour. The Guerrière was not quite so large a ship as the Constitution but the fire of the latter was the most accurate that had ever been seen. A few months later the Wasp took the Frolic, and the frigate United States took the Macedonian. This British ship lost a hundred and six men and the Americans lost twelve. Two months later the Constitution took the Java, and early in 1813, the Hornet took the Peacock.

England was stunned. During

almost continual war with France for twenty years she lost only five vessels, and had taken hundreds. Here in six months she had lost six and had taken none. Was it possible that she was no longer "Mistress of the seas?"

THE TIDE TURNS. "DON'T GIVE UP THE SHIP"

But during 1813, the tide turned. The British frigate Shannon, under Captain Broke, offered battle to the American frigate, Chesapeake. Though the Chesapeake had a new and untrained crew, Captain Lawrence had come to despise British skill, and sailed out to meet the Shannon, which had a good crew. In a few moments the Chesapeake was disabled and her commander was wounded, but as he was carried below he cried, "Don't give up the ship." Some of the sailors refused to fight and the ship was given up, though Captain Broke, of the Shannon, was killed.

"WE HAVE MET THE ENEMY AND THEY ARE OURS"

On land things went against us at first this year, and it began to seem as if we were to lose territory instead of capturing Canada, but in May, York (now called Toronto) was captured and the government building was burned. Then this same year a wonderful victory occurred. Lieutenant Oliver H. Perry built a small fleet on Lake Erie in a few weeks, and, on September 10, 1813, met a British fleet. The fighting was fierce, and on Perry's own little ship all the crew except eight were killed or disabled. They made their way in an open boat to another of his ships carrying their flag with them, and continued to fight. In a little while he was able to send the report, "We have met the enemy and they are ours." This victory enabled General William Henry Harrison to defeat the British and Indians and recapture Detroit.

The next year another attempt was made to invade Canada under Generals Jacob Brown and Winfield Scott. We shall hear much more of the second name in the next story of our land. Two very bloody battles were fought at Chippewa and at Lundy's Lane within sound of Niagara Falls, but though the Americans were successful, they were forced to retreat. The British tried to send a fleet and army by way of Lake Champlain by much the same road which Burgoyne, of whom you read on page 988, had taken, but at Plattsburg both fleet and army were driven back.

Another man who afterward won great fame now comes into notice. The Creek Indians in Alabama, who had risen against the Americans, were crushed, March 27, 1814, by a force under Andrew Jackson, about whom you may read on page 792 and in the next volume but one, and never made much trouble afterward.

WASHINGTON CAPTURED AND BURNED BY THE BRITISH

Just about this time Napoleon was defeated and driven from France, and England sent more soldiers to the United States. One force under General Ross found that Washington was not well defended, marched on the city and captured it without trouble. In return for the burning of Toronto, the Capitol and the White House were burned as you may read on page 390. Next they attempted to capture Baltimore, but were driven back. While a British fleet was bombarding the fort in the harbour Francis Scott Key wrote our national song, "The Star Spangled Banner."

All this time the Americans were successful on the sea. Most of the warships were blockaded in the harbours, but many privateers roamed the seas destroying British commerce. A privateer was a ship owned by a private individual, which was given permission to capture merchant vessels of the nation with which the country of the privateer was at war. Many of our ship owners put a few small cannon on board and instead of carrying goods sailed about looking for the enemy's trading vessels. An English paper said, "If they fight they are sure to conquer, if they fly they are sure to escape."

WHY THE NEW ENGLAND STATES OPPOSED THE WAR

The New England States continued to oppose the war, because it interfered with their profits. They would not allow their soldiers to fight outside their own state, and hindered the government in every way. In December, 1814, a number of their leaders met in Hartford, and advocated dissolving the Union. You will notice that during the first twenty-five years of our government, New England was threatening to leave the Union, a great deal of the time.

Next the British on January 8th, 1815, made an attack on New Orleans. Andrew Jackson, who defended the city, had thrown up breastworks made partly of cotton bales. Many of his men were Tennessee and Kentucky backwoodsmen, who could hit a squirrel in the top of the highest tree. The British commander, Sir Edward Pakenham, was a brother-in-law of the Duke of Wellington and his force was made up of veteran soldiers. He was like Braddock in looking down on the American troops, and instead of marching around them, determined to capture the breastworks. The British fought bravely but the wonderful marksmanship of the Americans was too much for them, and within less than half an hour, the British retreated, leaving 2,600 dead or wounded before the rude defences. Among the killed was their commander, but the American loss was only eight killed, and thirteen wounded. This was the most brilliant land victory of the war.

It is sad to think that this terrible sacrifice of life was unnecessary. On Christmas eve, two weeks before, a treaty of peace had been signed. But there was then no ocean telegraph, and no steamship had as yet crossed the ocean. Not until many days after the battle was the news received in this country.

THE TREATY OF PEACE SIGNED AT GHENT

The treaty of peace was a very strange paper. The chief reason we had gone to war was because England had stopped our vessels to search for forbidden goods, and had taken off sailors claiming them to be British subjects. Not a word was said about these matters in the treaty, but England did not stop any more of our ships. The truth is that both sides were anxious for peace. England wished it because the entire map of Europe had to be made over on account of the fall of Napoleon, and we wished it because our government seemed about to break down.

The war had been a great strain on the government, and except for what our navy did, we cannot be very proud of it. Congress was afraid to levy taxes high enough to get enough money, and many of our generals proved themselves poor leaders. The sections were so jealous of one another and of the Union that we did not do our best. But there was a bright side.

WHAT THE WAR DID FOR THE NATION

This war marks the end of the time of weakness for the new nation. It was again proved that, if the American was properly trained and properly led, he was at least a match for the best soldiers of Europe. On the sea American ships and sailors acknowledged no equals. In thirteen naval battles we were successful in eleven. We had beat England on the sea and no other nation had done this.

Then too, a feeling of pride in the United States had been brought out. In the beginning of the nation men were proud of their states and jealous of the nation. As new states were made the people felt that the Union was more important, for the Union had made the state. At the end of the war there were eighteen states, and six more were admitted in less than ten years.

Though the westward movement of the people had been great before the war, it was many times greater afterward. Thousands left the eastern states every year to make new homes in the wilderness. Forests were cleared, farms were planted, and towns sprang up almost like magic. In our eighth volume we shall tell you more of this great movement.

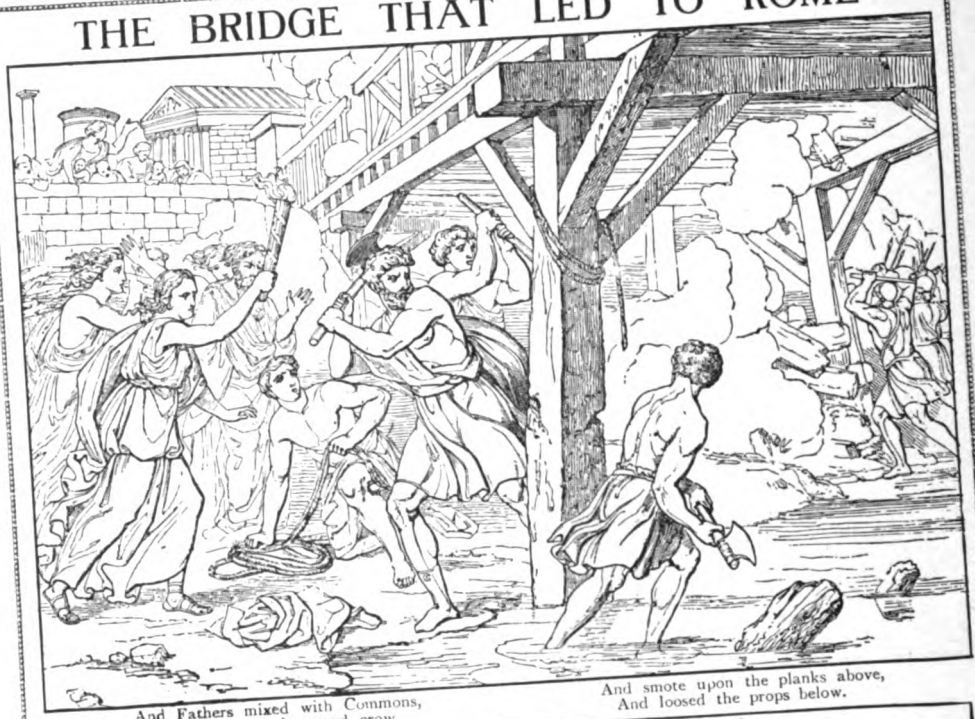
Continued on page 1593

A BATTLE FOUGHT AFTER PEACE WAS MADE

The battle of New Orleans, January 8th, 1815, is one of the most astonishing in the history of war. Here Wellington's veterans, supposed to be the best soldiers of Europe, were put to rout by a crowd of untrained backwoodsmen under a leader who had had no regular military training. Here we see General Jackson behind his breastworks, which had been hastily thrown up, but which proved themselves sufficient.

War is a terrible thing, even if it seems sometimes necessary. Sir Edward Pakenham came of a noble family, had won great reputation as a soldier in the wars with Napoleon, and came to America expecting to increase that reputation. He undervalued the American forces at New Orleans,—rashly attempted to storm the breastworks, and fell himself.

THE BRIDGE THAT LED TO ROME



And Fathers mixed with Commons,
Seized hatchet, bar, and crow,
And smote upon the planks above,
And loosed the props below.

But friends and foes in dumb surprise,
With parted lips and straining eyes,
Stood gazing where he sank;
And when above the surges
They saw his crest appear,
All Rome sent forth a rapturous cry,
And even the ranks of Tuscany
Could scarce forbear to cheer.

MACAULAY'S "LAYS OF ANCIENT ROME"

LORD MACAULAY was a great historian and a famous poet. His "Lays of Ancient Rome," published in 1842, are the most celebrated of his poetical writings. They tell us stirring stories of the early days of Rome as they might have been told by a poet living between three and four hundred years before Christ. These stories are not entirely true; they are partly true, however, and we call them legends. There was a real Horatius, whose second name was Cocles, which meant that he had only one eye; but no doubt his power is exaggerated in the legend here told. Etruria was an ancient kingdom in Italy, north of Rome; Lars Porsena, King of Etruria, declared war against Rome because that city had expelled its king, whose family came from Etruria; and Sextus, who accompanied Porsena, was the eldest son of the expelled King Tarquin. Rome was now a republic.

HOW HORATIUS KEPT THE BRIDGE

CONTINUED FROM 1278

LARS PORSENA of Clusium
By the Nine Gods he swore
That the great house of Tarquin
Should suffer wrong no more.
By the Nine Gods he swore it,
And named a trysting day,
And bade his messengers ride forth
East and west and south and north,
To summon his array.

. . . . . .

And now hath every city
Sent up her tale of men;
The foot are fourscore thousand,
The horse are thousands ten:
Before the gates of Sutrium
Is met the great array.
A proud man was Lars Porsena
Upon the trysting day.

. . . . . .

But by the yellow Tiber
Was tumult and affright:
From all the spacious champaign
To Rome men took their flight.
A mile around the city,
The throng stopped up the ways;
A fearful sight it was to see
Through two long nights and days.

. . . . . .

To eastward and to westward
Have spread the Tuscan bands;
Nor house, nor fence, nor dovecote
In Crustumerium stands.
Verbenna down to Ostia
Hath wasted all the plain;
Astur hath stormed Janiculum,
And the stout guards are slain.

I wis (think), in all the Senate,
There was no heart so bold,
But sore it ached and fast it beat,
When that ill news was told.
Forthwith up rose the Consul,
Up rose the Fathers all;
In haste they girded up their gowns,
And hied them to the wall.

They held a council standing
Before the River Gate;
Short time was there, ye well may guess,
For musing or debate.
Out spake the Consul roundly:
"The bridge must straight go down;
For, since Janiculum is lost,
Nought else can save the town."

Just then a scout came flying,
All wild with haste and fear;
"To arms! to arms! Sir Consul:
Lars Porsena is here."
On the low hills to westward
The Consul fixed his eye,
And saw the swarthy storm of dust
Rise fast along the sky.

And nearer fast and nearer
Doth the red whirlwind come;
And louder still and still more loud,
From underneath that rolling cloud
Is heard the trumpet's war-note proud,
The trampling and the hum.
And plainly and more plainly
Now through the gloom appears,
Far to left and far to right,
In broken gleams of dark-blue light,
The long array of helmets bright,
The long array of spears.

And plainly and more plainly,
Above that glimmering line,
Now might ye see the banners
Of twelve fair cities shine;
But the banner of proud Clusium
Was highest of them all,
The terror of the Umbrian,
The terror of the Gaul.

And plainly and more plainly
Now might the burghers know,
By port and vest, by horse and crest,
Each warlike Lucumo.
There Cilnius of Arretium
On his fleet roan was seen;
And Astur of the fourfold shield,
Girt with the brand none else may wield,
Tolumnius with the belt of gold,
And dark Verbenna from the hold
By reedy Thrasymene.

Fast by the royal standard,
O'erlooking all the war,
Lars Porsena of Clusium
Sat in his ivory car.
By the right wheel rode Mamilius
Prince of the Latian name;
And by the left false Sextus,
That wrought the deed of shame.

But when the face of Sextus
Was seen among the foes,
A yell that rent the firmament
From all the town arose.
On the house-tops was no woman
But spat towards him and hissed,
No child but screamed out curses,
And shook his little fist.

But the Consul's brow was sad,
And the Consul's speech was low,
And darkly looked he at the wall,
And darkly at the foe.
"Their van will be upon us
Before the bridge goes down;
And if they once may win the bridge,
What hope to save the town?"

Then out spake brave Horatius,
The Captain of the Gate:
"To every man upon this earth
Death cometh soon or late.
And how can man die better
Than facing fearful odds,
For the ashes of his fathers,
And the temples of his Gods?

. . . . . .

"Hew down the bridge, Sir Consul,
With all the speed ye may;
I, with two more to help me,
Will hold the foe in play.
In yon straight path a thousand
May well be stopped by three.
Now who will stand on either hand,
And keep the bridge with me?"

Then out spake Spurius Lartius;
A Ramnian proud was he:
"Lo, I will stand at thy right hand,
And keep the bridge with thee."
And out spake strong Herminius;
Of Titian blood was he:
"I will abide on thy left side,
And keep the bridge with thee."

"Horatius," quoth the Consul,
"As thou sayest, so let it be."
And straight against that great array
Forth went the dauntless Three.
For Romans in Rome's quarrel
Spared neither land nor gold,
Nor son nor wife, nor limb nor life,
In the brave days of old.

Then none was for a party,
Then all were for the State;
Then the great man helped the poor,
And the poor man loved the great,
Then lands were fairly portioned,
Then spoils were fairly sold;
The Romans were like brothers
In the brave days of old.

Now Roman is to Roman
More hateful than a foe,
And the Tribunes beard the high,
And the Fathers grind the low.
As we wax hot in faction,
In battle we wax cold:
Wherefore men fight not as they fought
In the brave days of old

Now while the Three were tightening
Their harness on their backs,
The Consul was the foremost man
To take in hand an axe:
And Fathers mixed with Commons,
Seized hatchet, bar, and crow,
And smote upon the planks above,
And loosed the props below.

Meanwhile the Tuscan army,
Right glorious to behold,
Came flashing back the noonday light,
Rank behind rank, like surges bright
Of a broad sea of gold.
Four hundred trumpets sounded
A peal of warlike glee,
As that great host, with measured tread,
And spears advanced, and ensigns spread,
Rolled slowly towards the bridge's head,
Where stood the dauntless Three.

The Three stood calm and silent,
And looked upon the foes,
And a great shout of laughter
From all the vanguard rose:
And forth three chiefs came spurring
Before that deep array;
To earth they sprang, their swords they drew,
And lifted high their shields and flew
To win the narrow way;

Aunus from green Tifernum
Lord of the Hill of Vines;
And Seius, whose eight hundred slaves
Sicken in Ilva's mines;
And Picus, long to Clusium
Vassal in peace and war,
Who led to fight his Umbrian powers
From that grey crag where, girt with towers,
The fortress of Nequinum lowers
O'er the pale waves of Nar.

Stout Lartius hurled down Aunus
Into the stream beneath;
Herminius struck at Seius,
And clove him to the teeth;
At Picus brave Horatius
Darted one fiery thrust;
And the proud Umbrian's gilded arms
Clashed in the bloody dust.

Then Ocnus of Falerii
Rushed on the Roman Three;
And Lausulus of Urgo
The rover of the sea;
And Aruns of Volsinium,
Who slew the great wild boar,
The great wild boar that had his den
Amidst the reeds of Cosa's fen,
And wasted fields and slaughtered men,
Along Albinia's shore.

Herminius smote down Aruns;
Lartius laid Ocnus low;
Right to the heart of Lausulus
Horatius sent a blow.
"Lie there," he cried, "fell pirate!
No more, aghast and pale,
From Ostia's walls the crowd shall mark
The track of thy destroying bark.
No more Campania's hinds shall fly
To woods and caverns when they spy
Thy thrice accursed sail."

And now no sound of laughter
Was heard among the foes.
A wild and wrathful clamour
From all the vanguard rose.
Six spears' lengths from the entrance
Halted that deep array,
And for the space no man came forth
To win the narrow way.

But hark! the cry is Astur:
And lo! the ranks divide;
And the great Lord of Luna
Comes with his stately stride.
Upon his ample shoulders
Clangs loud the fourfold shield,
And in his hand he shakes the brand
Which none but he can wield.

He smiled on those bold Romans
A smile serene and high;
He eyed the flinching Tuscans,
And scorn was in his eye.
Quoth he, "The she-wolf's litter
Stand savagely at bay;
But will ye dare to follow,
If Astur clears the way?"

Then, whirling up his broadsword
With both hands to the height,
He rushed against Horatius,
And smote with all his might.
With shield and blade Horatius
Right deftly turned the blow.
The blow, though turned, came yet too nigh;
It missed his helm, but gashed his thigh;
The Tuscans raised a joyful cry
To see the red blood flow.

He reeled, and on Herminius
He leaned one breathing-space;
Then, like a wild cat mad with wounds,
Sprang right at Astur's face;
Through teeth, and skull, and helmet
So fierce a thrust he sped,
The good sword stood a hand breadth out
Behind the Tuscan's head.

And the great Lord of Luna
Fell at that deadly stroke,
As falls on Mount Alvernus
A thunder-smitten oak.
Far o'er the crashing forest
The giant arms lie spread;
And the pale augurs, muttering low,
Gaze on the blasted head.

On Astur's throat Horatius
Right firmly pressed his heel,
And thrice and four times tugged amain,
Ere he wrenched out the steel.

"And see," he cried, "the welcome,
Fair guests, that waits you here!
What noble Lucumo comes next
To taste our Roman cheer?"

But at his haughty challenge
A sullen murmur ran,
Mingled of wrath, and shame, and dread,
Along that glittering van.
There lacked not men of prowess,
Nor men of lordly race;
For all Etruria's noblest
Were round the fatal place.

But all Etruria's noblest
Felt their hearts sink to see
On the earth the bloody corpses,
In the path the dauntless Three:
And, from the ghastly entrance
Where those bold Romans stood,
All shrank, like boys who unaware,
Ranging the woods to start a hare,
Come to the mouth of the dark lair
Where, growling low, a fierce old bear
Lies amidst bones and blood.

Was none who would be foremost
To lead such dire attack:
But those behind cried "Forward!"
And those before cried "Back!"
And backward now and forward
Wavers the deep array;
And on the tossing sea of steel,
To and fro the standards reel;
And the victorious trumpet-peal
Dies fitfully away.

Yet one man for one moment
Stood out before the crowd;
Well known was he to all the Three,
And they gave him greeting loud,
"Now welcome, welcome, Sextus!
Now welcome to thy home!
Why dost thou stay, and turn away?
Here lies the road to Rome."

Thrice looked he at the city,
Thrice looked he at the dead;
And thrice came on in fury,
And thrice turned back in dread:
And, white with fear and hatred,
Scowled at the narrow way,
Where, wallowing in the pool of blood,
The bravest Tuscans lay.

But meanwhile axe and lever
Have manfully been plied;
And now the bridge hangs tottering
Above the boiling tide.
"Come back, come back, Horatius!"
Loud cried the Fathers all.
"Back, Lartius! back, Herminius!
Back, ere the ruin fall!"

Back darted Spurius Lartius;
Herminius darted back:
And, as they passed, beneath their feet,
They felt the timbers crack.
But when they turned their faces,
And on the farther shore
Saw brave Horatius stand alone,
They would have crossed once more.

But with a crash like thunder
Fell every loosened beam,
And, like a dam, the mighty wreck
Lay right athwart the stream.

And a long shout of triumph
Rose from the walls of Rome.
As to the highest turret-tops
Was splashed the yellow foam.
And, like a horse unbroken
When first he feels the rein,
The furious river struggled hard,
And tossed his tawny mane,
And burst the curb and bounded,
Rejoicing to be free,
And whirling down, in fierce career,
Battlement, and plank, and pier,
Rushed headlong to the sea.

Alone stood brave Horatius,
But constant still in mind;
Thrice thirty thousand foes before,
And the broad flood behind.
"Down with him!" cried false Sextus,
With a smile on his pale face.
"Now yield thee," cried Lars Porsena,
"Now yield thee to our grace."

Round turned he, as not deigning
Those craven ranks to see;
Nought spake he to Lars Porsena,
To Sextus nought spake he;
But he saw on Palatinus
The white porch of his home;
And he spake to the noble river
That rolls by the towers of Rome.

"Oh, Tiber! Father Tiber!
To whom the Romans pray,
A Roman's life, a Roman's arms,
Take thou in charge this day!"
So he spake, and speaking sheathed
The good sword by his side,
And with the harness on his back
Plunged headlong in the tide.

No sound of joy or sorrow
Was heard from either bank;
But friends and foes in dumb surprise,
With parted lips and straining eyes,
Stood gazing where he sank;
And when above the surges
They saw his crest appear,
All Rome sent forth a rapturous cry,
And even the ranks of Tuscany
Could scarce forbear to cheer.

But fiercely ran the current,
Swollen high by months of rain:
And fast his blood was flowing;
And he was sore in pain.
And heavy with his armour,
And spent with changing blows:
And oft they thought him sinking,
But still again he rose.

Never, I ween, did swimmer,
In such an evil case,
Struggle through such a raging flood
Safe to the landing-place;
But his limbs were borne up bravely
By the brave heart within,
And our good Father Tiber
Bore bravely up his chin.

"Curse on him!" quoth false Sextus;
"Will not the villain drown?
But for this stay, ere close of day
We should have sacked the town!"
"Heaven help him!" quoth Lars Porsena,
"And bring him safe to shore;
For such a gallant feat of arms
Was never seen before."

And now he feels the bottom,
Now on dry earth he stands;
Now round him throng the Fathers
To press his gory hands;
And now, with shouts and clapping,
And noise of weeping loud,
He enters through the River Gate,
Borne by the joyous crowd.

They gave him of the corn-land,
That was of public right,
As much as two strong oxen
Could plough from morn till night;
And they made a molten image,
And set it up on high,
And there it stands unto this day
To witness if I lie.

It stands in the Comitium,
Plain for all folk to see;
Horatius in his harness,
Halting upon one knee:
And underneath is written,
In letters all of gold,
How valiantly he kept the bridge
In the brave days of old.

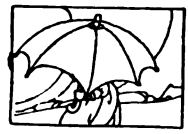
. . . . . .

When the goodman mends his armour,
And trims his helmet's plume;
When the goodwife's shuttle merrily
Goes flashing through the loom;
With weeping and with laughter
Still is the story told,
How well Horatius kept the bridge
In the brave days of old.

LITTLE VERSES FOR VERY LITTLE PEOPLE

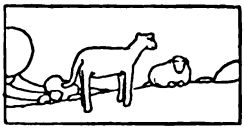
JANUARY brings the snow,
Makes our feet and fingers glow.

FEBRUARY brings the rain,
Thaws the frozen lake again.



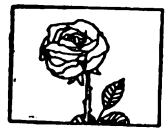
MARCH brings breezes loud and shrill,
Stirs the dancing daffodil.

APRIL brings the primrose sweet,
Scatters daisies at our feet.



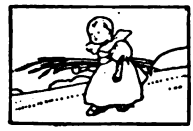
MAY brings flocks of pretty lambs,
Skipping by their fleecy dams.

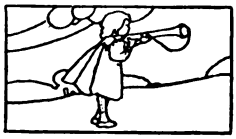
JUNE brings tulips, lilies, roses,
Fills the children's hands with posies.



HOT July brings cooling showers,
Apricots and gillyflowers.

AUGUST brings the sheaves of corn,
Then the harvest home is borne.





WARM September brings the fruit,
Sportsmen then begin to shoot.

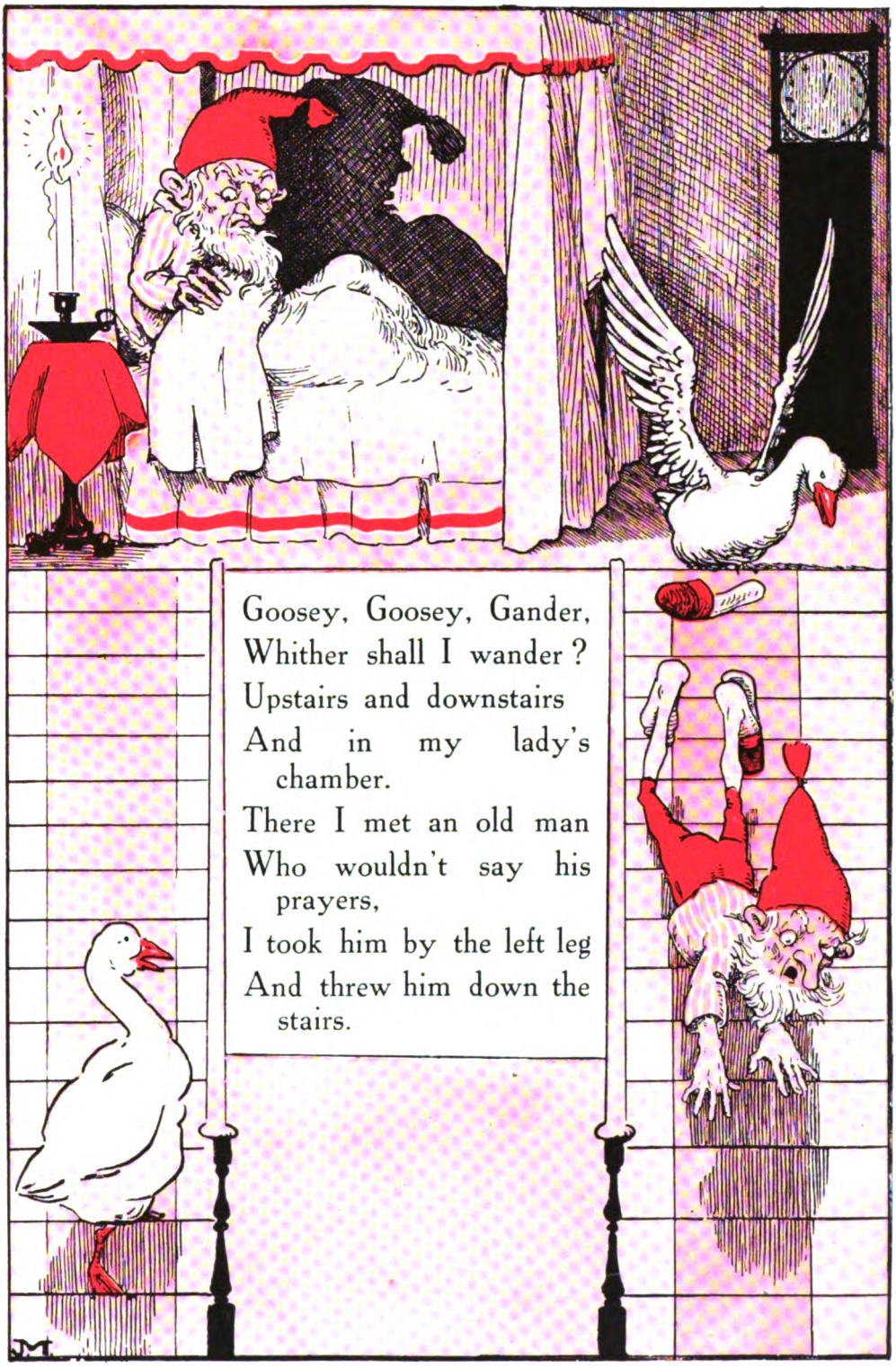
FRESH October brings the pheasant,
Then to gather nuts is pleasant.

DULL November brings the blast,
Then the leaves are whirling fast.

CHILL December brings the sleet,
Blazing fire and Christmas treat.

The Little Cock Sparrow

A LITTLE cock sparrow sat on a green tree,
And he chirruped, he chirruped, so merry was he;
A naughty boy came with his wee bow and arrow,
Determined to shoot this little cock sparrow.
"This little cock sparrow shall make me a stew,
And his giblets shall make me a little pie, too;"
"Oh, no!" said the sparrow, "I *won't* make a stew,"
So he flapped his wings and away he flew.



Goosey, Goosey, Gander,
Whither shall I wander?
Upstairs and downstairs
And in my lady's chamber.
There I met an old man
Who wouldn't say his prayers,
I took him by the left leg
And threw him down the stairs.

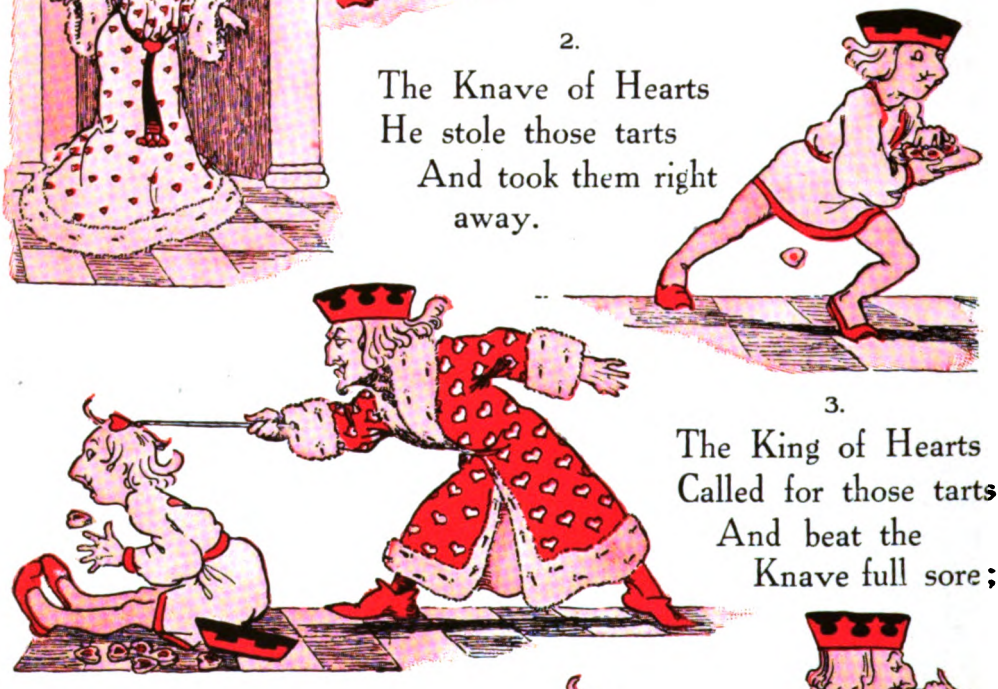
The Knave of Hearts

1.

The Queen of Hearts
She made some tarts
All on a summer's day;

2.

The Knave of Hearts
He stole those tarts
And took them right
away.

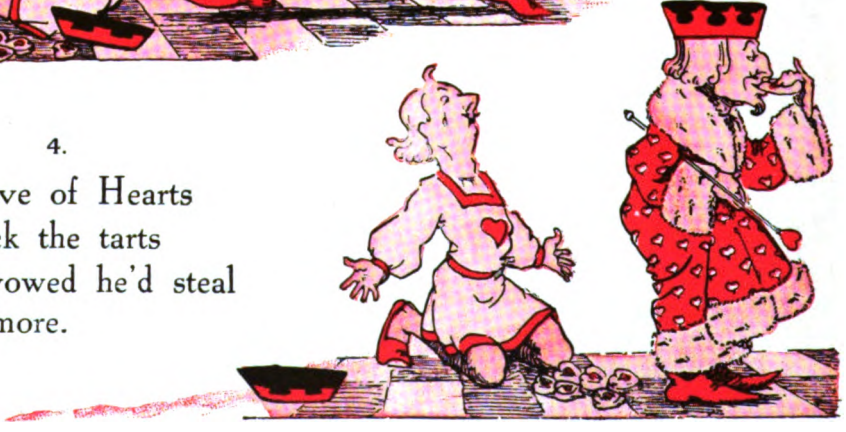


3.

The King of Hearts
Called for those tarts
And beat the
Knave full sore;

4.

The Knave of Hearts
Gave back the tarts
And vowed he'd steal
no more.



A WALK BY THE SEASHORE

CONTINUED FROM 1343

ONE of the reasons for the existence of such things as railway lines, steam engines, express trains, guards, porters, and newsboys is the very simple but important fact that children who live in cities *must* be carried, with their buckets and spades, at least once a year to dig castles in the sands of the seashore. Thousands and thousands of dollars are spent in this manner. And if there were no buckets and spades, and no sand at the seaside, hundreds of guards and porters would be thrown out of work, and far fewer trains would go screeching and thundering across the green fields. So, you see, children are good for trade as well as good for nothing, as your nurse sometimes tells you.

But then there are other things to do at the seaside in addition to castle digging. Castle digging is, of course, the chief reason for the existence of the sand, and it *is* splendid—particularly when half a dozen diggers are at work, and the castle has terraces and turrets, with a deep moat running all round it and a bridge across it, and no end of sea-grass and tangled seaweed hanging over the parapets, like moss and lichen. But there are other things as well. There is paddling, for instance, a daring sport, something like fox-hunting, but one which the dear doctors say gives children so many illnesses. And there is also the joy of listening to organs, and going for rides on shaggy donkeys, whose saddles are worn into holes, showing the padding, and who smell like hot blankets and a bootmaker's apron. And there are cocoa-nut shies, and conjuring, and throwing stones at a tin bucket on papa's walking-stick, and tennis; and there is even kicking off our sand shoes and running barefoot races on the smooth-ribbed sand.

And there is—*going for a walk with our eyes open.*

Suppose you were taken one year not to Long Branch, or Portsmouth, or Nantucket, or Narragansett, or Coronada, or Norfolk, but to a little old rickety fishing village, with no esplanade, no pier, no band, no monkeys, no donkeys, *no nothing*—would it be very dull? Suppose, too, that instead of broad, smooth, yellow sands, the waves came breaking with a rattle and a roar on miles of shingle—miles and miles of stones!—would it be very dull? Well, it all depends on whether you keep your eyes open or shut, and whether you want to cram your brain with observation, or keep it only for the multiplication table and geography.

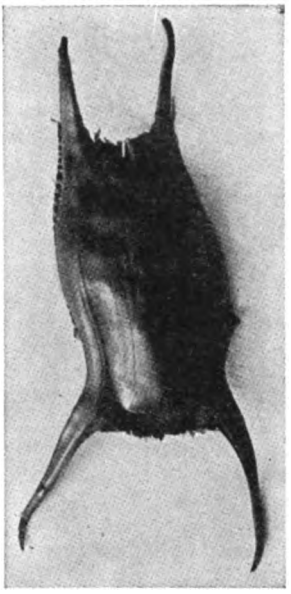
For a walk along the sands or along the shingle can be full of interest every yard of the way. To begin with, it is by the side of the sea that we can best feel the tremendous wonder of creation. The sea is older than anything else on the earth; it has always been there, and—just think of it—from the very beginning it has always been moving. Motion is a marvellous miracle. The motion of the sea, which you look at with your eyes, and the noise of it, which fills your ears, existed

thousands and thousands of years before there was any animal walking about the earth, and wondering where in the name of fortune it came from. Stop and think about the deep boom of the ocean and the roar of the waves on shore and rock, going on for thousands of years before there was even a mouse or a grasshopper on the green earth. How grand, but how lonely it must have been!

Then think about the sands. Take up a handful near the cliffs, and it runs through your fingers like powder; go near to the waves, where it is wet, and you will see in it tiny grains of various colours. The sands have been smashed and powdered by the sea. Once they were shells and stones; the sea has ground them into dust. Every year the stones on a beach grow smaller and smaller. If you make a hole in the sand, and thrust your arm down as far as it will go, you will sometimes find rough sand.

Then, whether you walk on smooth yellow sand, or trudge heavily over pebbles, you will find no end of things which are most interesting to pick up and examine. There is the starfish, that little five-fingered, red-brown fellow, who lies dead or dying in hundreds all round the coast; turn him over on his back, and if he is alive you will find that he can turn himself over as cleverly as a gymnast, for he has any number of tentacles on his under-side, which he uses when he goes for a walk over the rocks in search of a seaside breakfast. He feeds, let me tell you, on dead fish, and things that no respectable live fish would look at for a moment, so he is useful to keep the sea clean.

Then there is the jellyfish, which floats in the waves and has to go wherever they choose to send him, for he has got no legs, no fins, no tentacles to speak of, and is really hardly a live thing at all. But it is just because he is such a helpless dead-alive old fellow that he is interesting. He reminds us of the very beginning of life. He is life at its lowest. He just goes about like a man in a dream, only bothering to keep all his pores open to drink water; and if you catch him, and lay him on the sands, the sun will soon drink him clean up, and leave nothing to tell he has ever been at all, except a streak of silvery-whitish slime. And yet he is ever so much more alive than the finest pair of patent-leather boots in a Chicago shop-window or the grandest statue in the Metropolitan Museum. He rides out a storm like a man-o'-war. It is only when we compare him with a milkman, or a boy spinning a peg-top and picking it up in his hand, that we see how very, very little alive he really is.



A very familiar thing found on the seashore is the egg-shell of a skate, looking like a tiny handbarrow. Generally the young skate is hatched before the shell is found.

Shells are wonderfully interesting things. Have you noticed that the shell of a whelk has its opening always on the right side? I know a man who is extremely happy because he once dug up in a crag-pit the shell of a whelk, much older than the human race, which has its opening on the left side. How did that happen? Or why should a shell almost always have its opening on the right side? Why is it? Have you ever thought about that? Nature is the most teasing riddle in the world, very hard to solve.

Sometimes you will find one of these whelk-shells inhabited by a funny little crab-like creature, who can be dragged out a great way, but will never leave go with his tail. He'll give you his head cheerfully, but never, never will he give up his tail to you or the Czar of Russia. He's most particular about his tail, and always leaves it behind him when he is pulled out of doors. This is the hermit crab, and he is the cuckoo of the seashore; for the lazy fellow never thinks of making his own shell; he says: "Why should I, when there are so many far better shells than ever I could make close at hand?" And he just pops into the cast-off

shell of some other creature, or even eats that creature out of house and home, and adds insult to injury by occupying the house and home himself after the dinner.

If I were to begin to tell you about crabs there would be no end to it; so I must only say, that if you want to make an alderman jealous, carry home two or three green crabs in a bucket of water, and then show the alderman how these brave fellows fight and tussle over every piece of meat you drop into the water. Crabs have magnificent appetites. Nothing, you see, can ever really be to them "a good blow out." I believe a crab would knock his own mother over, or dance on his baby sister, to get at a piece of lean beef or a slice of new spring lamb—and this, if you please, after he has just had a dinner big enough for a troop of horse. Crabs ought to be called sea-hogs.

The seaweed was perhaps the first thing that grew in the sea. This is the seaweed known as bladder-wrack, which floats ashore easily because the knobs we see on it are really little vessels of air.

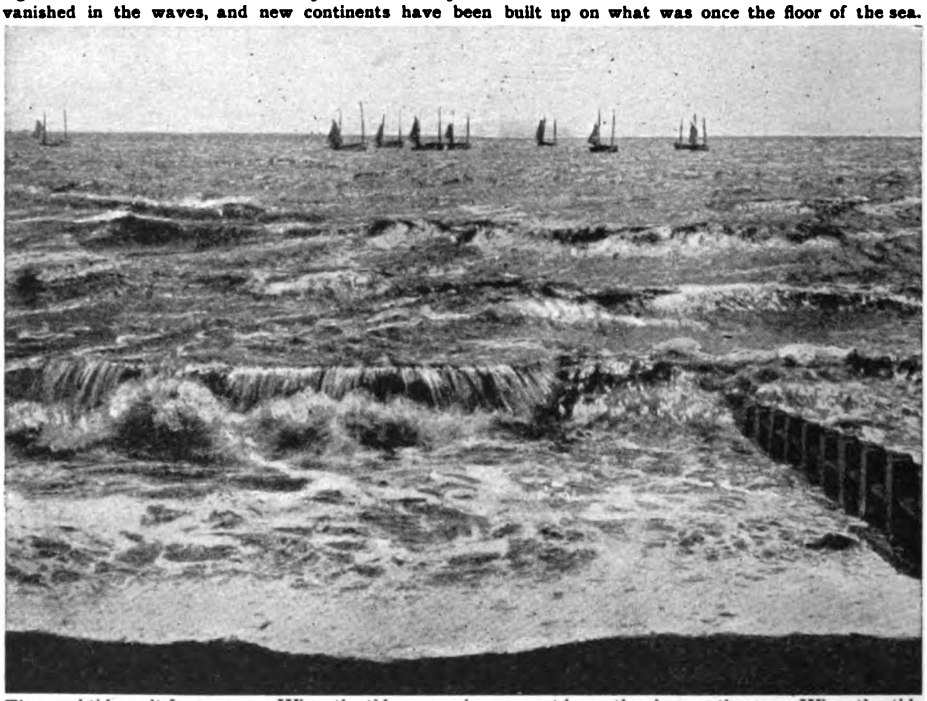
The sea anemone is not so fierce-looking as the crab, but she—they are beautiful enough to be called shes—is hardly as nice in her behaviour as we could wish. Look at them in a rocky pool, lying so gracefully and innocently on the silver sand, with beautiful soft green sea-grass on each side of them. No wonder we call them anemones; they are the flowers of the sea. But look. A poor little baby shrimp—who has forgotten what his mother told him about keeping safe at home—darts out for a scamper across the pool. If we had very powerful eyes, we should probably see the anemone trembling all over with delight as jelly would on the dining-room table when someone kicks the leg. "Ha, ha!" says the innocent-looking anemone. "Fee-fi-fo-fum, I smell the blood of a shrimpyman!" and lo and behold, just as the baby shrimp darts across the top of the anemone, and touches the trembling tentacles, "*Snap!*" cries that deceitful creature, and holds the baby shrimp as tight as a nut in the crackers. It is all over with the shrimp. His mother will never see him again. He will never wag his tail and wink his eye at baby lobsters. He will never grow up to be caught by a respectable fisherman in a kind net, and eaten by a dear little boy with bread and butter and watercress at five o'clock tea. No; he has grown into one body with a beautiful and innocent-looking anemone.

There are hundreds of things to be looked at in pools. If you lie on the rocks, and keep quite still, looking down into the clear water, you will see many little fish, such as the blenny, and the fur-bearded rockling, and bright-coloured wrasses, besides no end of queer crabs, shrimps, and anemones. It is splendid work to observe all this mysterious life going on in one tiny pool, and to dream of what these creatures think, and to wonder what becomes of them—for they really are alive—when they die.

And it is also most interesting to make a collection of creatures and seaweed, and carry them home in a bucket or satchel, and examine them carefully under a big magnifying glass. You will be amazed to find how much extraordinary thought and power has gone to the creation of the very tiniest thing that you can find on the seashore.

WHAT ARE THE WILD WAVES SAYING?

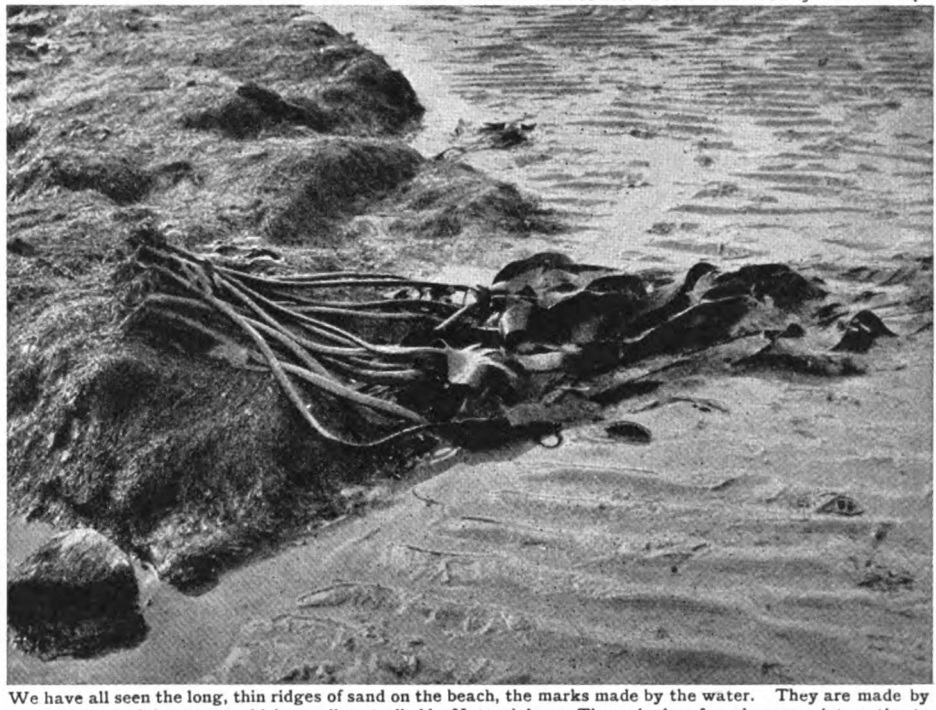
The sea is always moving. It has never been still since the world was made, and it cannot be still so long as the earth keeps its place in the heavens. As we stand on the shore and watch the waves, we know that the **sight which we see has been seen by men since they first came into the world. Old-time continents have vanished in the waves, and new continents have been built up on what was once the floor of the sea.**



Time and tide wait for no man. When the tide comes in, we must leave the shore to the sea. When the tide goes out, we have the sands, newly washed and clean, to ourselves again. **The sea, with the flow and ebb of its tide, washes the shores of the whole earth; and the air that comes in to us over its waves makes us strong and healthy. The sea is rough in these pictures, but underneath the waters are calm and still. The waves at sea do not "travel," but move only forward and back again, and they are only on the surface, not below.**

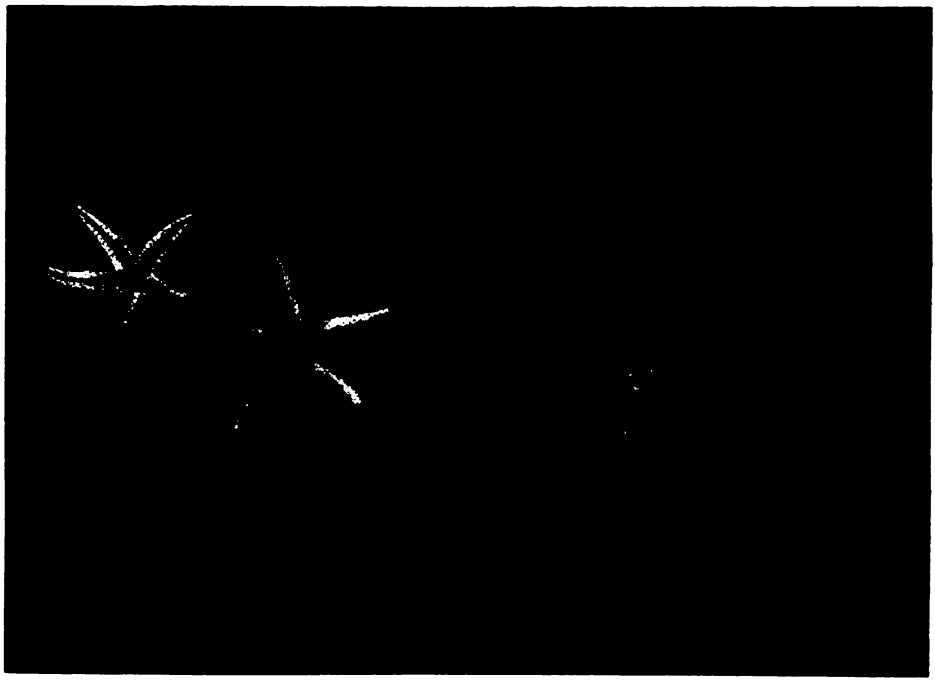
WHAT THE TIDE LEAVES BEHIND

It is pleasant to sit down after a romp, and rest and think of the wonders of the pools and rocks, and to see such a vast stretch of seaweed as this gaining new life by coming into the sunshine for a few hours. Without the change from air to water and from water to air some of the seaweeds could not live. Some kinds live fifty fathoms deep.



We have all seen the long, thin ridges of sand on the beach, the marks made by the water. They are made by the movement of the waves, which are all controlled by Nature's laws. These ripples of sand are very interesting to look at, and scientists who have studied them have come to believe that, perhaps, the Goodwin Sands, on which so many ships have been wrecked, are only huge "ripples," which may, perhaps, be removed by the skill of engineers.

LIVING THINGS CAST UP BY THE SEA



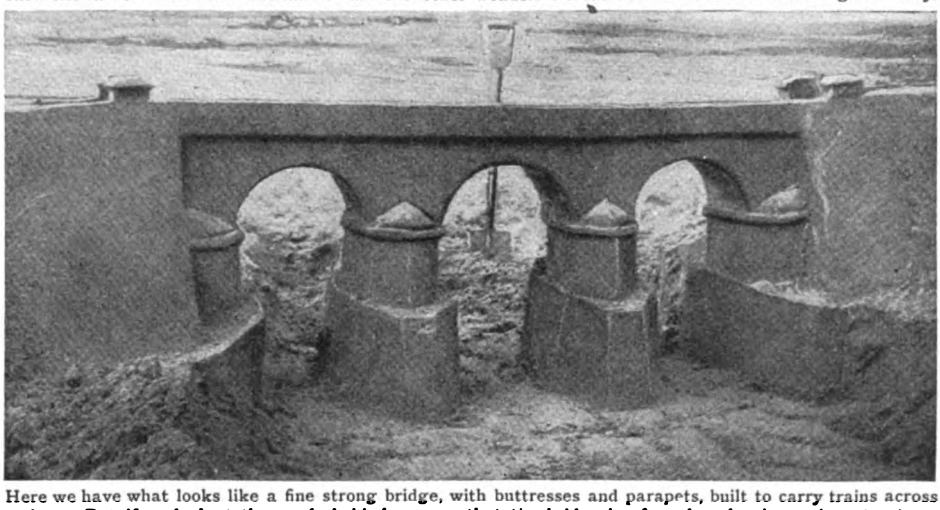
Such creatures as these are cast up every day by the sea, and we do not think, perhaps, as we look at them, that these little things have life. Of course they have. The starfishes left by the tide will be all right when the next tide comes in. The little bundles on the right are eggs, which will soon turn into numerous young whelks.

This poor jellyfish ought to have said good-bye to the sea before being cast up by the tide. Unless it can be continually taking in sea-water, the jellyfish must die. Exposed to the air, the water that it contains dries up, and the whole jellyfish disappears, leaving only a silvery mark on the ground where it was stranded.

THE SAND BUILDERS OF THE BEACH

Can this be a strong castle which a scowling baron has built to keep children from the shore? No; it is a beautiful work made of sand, over which the smallest child could hop, and will soon be washed away.

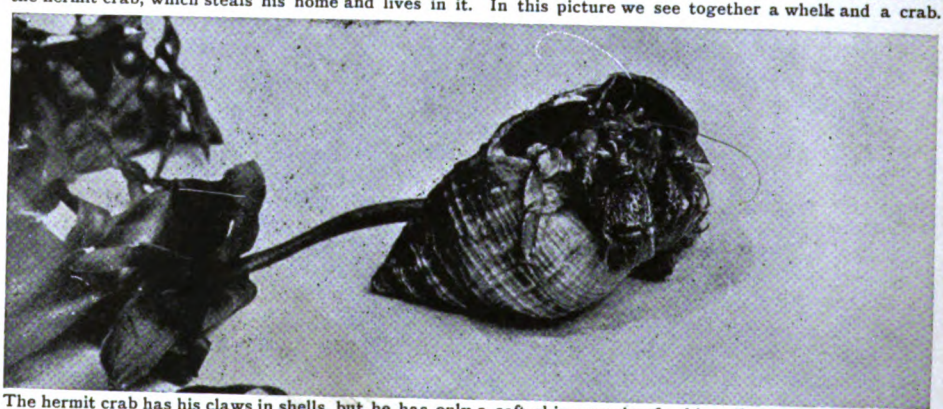
Bold barons may build castles; but so, at the seaside, may little maids. Here are plenty of them all together, each one full of fairies and mermaids and the other wonderful creatures which live in a little girl's fancy.



Here we have what looks like a fine strong bridge, with buttresses and parapets, built to carry trains across a river. But, if we look at the spade behind, we see that the bridge is of sand, and quite a tiny structure.

THE HERMIT CRAB IN HIS SHELL

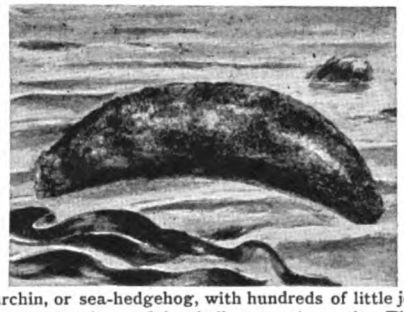
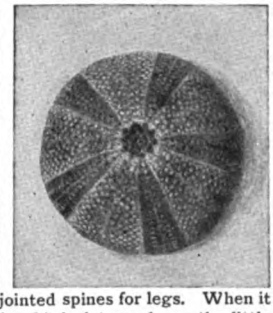
The whelk is one of the terrors of the smaller shellfish, upon which he lives. He has 300 teeth, as sharp and hard as files. With these he cuts through the shell and eats the fish inside. But the whelk has a master in the hermit crab, which steals his home and lives in it. In this picture we see together a whelk and a crab.



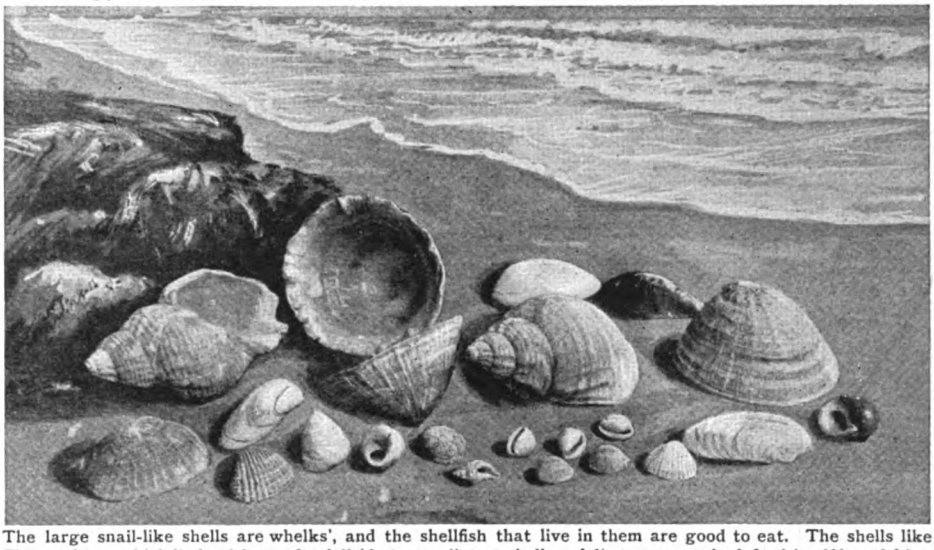
The hermit crab has his claws in shells, but he has only a soft skin covering for his tail, which any lobster or big crab would bite off. So he creeps into the shell of the whelk, and wherever he goes he drags the shell about with him. He is a fierce little crab, and fights in safety while his tail is protected by the shell of the whelk.

The crab and the sea-urchin are two of the wonders of sea life. The crab sheds his shell every year. It manages, in a marvellous manner, to withdraw its great claws through the tiny holes of its shell. The sea-urchin is a wonder of a different sort. As its egg-like body grows, so its hard, prickly shell grows too, just as if it were a soft plant. It is called a sea-urchin because it is like a hedgehog, by some country folk called an "urchin."

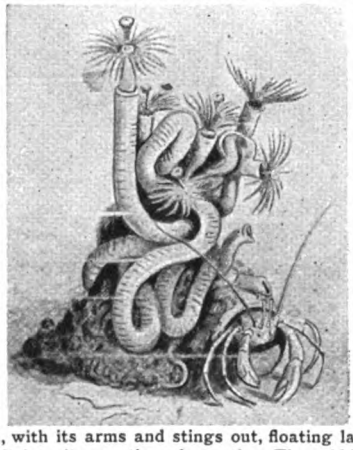
COMMON OBJECTS OF THE SEASHORE

The first picture shows a sea-urchin, or sea-hedgehog, with hundreds of little jointed spines for legs. When it dies they get broken off, and you see the plates of the shell armour beneath. The third picture shows the little spots where the spines joined on. Hold the shell towards the light and you will see tiny holes, a big mouth, and what strong jawbones! The sea-cucumber, unlike the sea-urchin, is soft. It tries to make a shell under its coat.



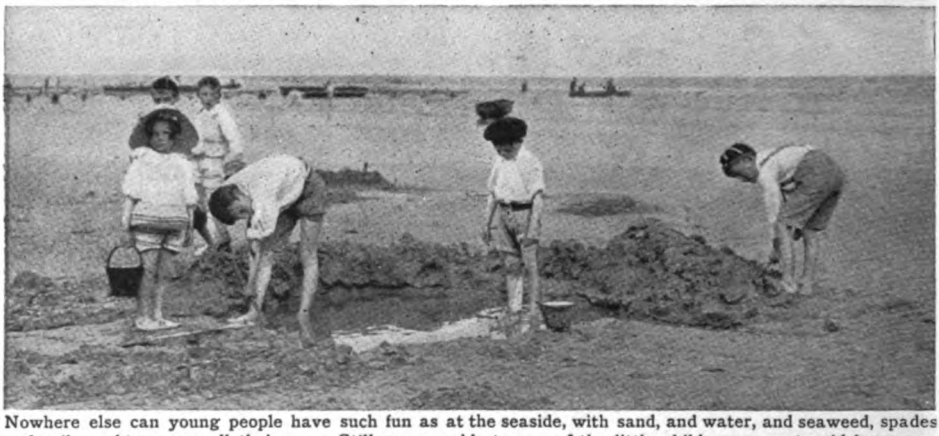
The large snail-like shells are whelks', and the shellfish that live in them are good to eat. The shells like Chinese hats, which little girls use for dolls' hats, are limpet-shells. A limpet can only defend itself by sticking so fast to a rock that you cannot tug it off. Just try; the harder you pull, the faster it will stick to the rock. The wee fluted shells are cowries, which some native races in West Africa and South Asia use for money.


The first picture shows a jellyfish, with its arms and stings out, floating lazily along in the water. It wraps them round its food, and pushes it into its mouth underneath. The middle picture shows the tube-worms, which make tubes of shell or sand to live in on the big shells or rocks. They breathe through the tufts. The last picture is a sea-anemone which chose to live on a whelk-shell, and is ready for the next shrimp.

The photographs on these pages are by Prof. B. H. Bentley, Messrs. Valentine, and others.

CHILDHOOD'S ANCIENT FIELD OF PLAY



Nowhere else can young people have such fun as at the seaside, with sand, and water, and seaweed, spades and pails, and treasures all their own. Still we are able to say of the little child, as a poet said long ago:

Shoreward she hies, her wooden spade in hand,
Straight down to childhood's ancient field of play,
To claim her right of common in the land
Where little edgeless tools make easy way—
A right no cruel Act shall e'er gainsay,
No greed dispute the freedom of the sand.

THE NEXT PICTURES OF FAMILIAR THINGS BEGIN ON PAGE 1535

WHAT THIS STORY TELLS US

WE know something about the elements and the atoms of which they are made; and we have guessed that atoms are not really "uncutable," as the word says, but must be made of something simpler still. In these pages we learn that atoms were not made out of nothing once for all, but are changing from age to age, some slowly and others quite quickly. We can see big atoms breaking up into smaller ones, and into tiny particles which are really electric, and are called electrons. These electrons are so small that there are great numbers in a single atom. They are the real units out of which atoms are made, and the discovery of them, within the last twelve years, is one of the greatest in the whole history of science. They are a new kind of atoms, atoms of electricity, and though we call them electrons, they are really entitled to be called atoms, for they cannot be divided or cut, whereas men have just discovered that the things we do call atoms can be cut and divided.

THE MAKING OF THE ELEMENTS

CONTINUED FROM 1295

WE have seen that several, at least, of the elements have a history which we can trace. We can actually watch some of them being made before our eyes—elements with small atoms, made by the breaking up of the large atoms of other elements. We are quite certain that, of the elements we know, helium, argon, neon, and radium are now being made in the earth from other elements—the first three from radium, and radium from uranium.

Having learned this, we have also reason to suspect that many other elements are so being made. The astronomers who devote themselves especially to the study of the light given out by the heavenly bodies assure us that they find evidence of the same kind of thing going on in other worlds than ours. Apart from all this positive evidence—for some of it is now really positive and as certain as that coal will burn—we have the work which was begun by a great Russian chemist many years ago, showing us that the elements we know can all be arranged in groups according to a law which can only mean one thing—that they are related to each other in the closest way.

We have, therefore, to recognise something which at first may confuse us a little, and has, indeed, confused a great many people. We have already talked about the difference between an element and a compound, water being the best example of a compound, whilst oxygen and hydrogen, which form water, are good examples of elements. We have said that an element is made of atoms all of the same kind, while a compound is made by the union of atoms of different elements, two or more.

That is all true, and no one disputes it. But we have now learned the further truth that the elements themselves are made of atoms which are not simple, but are themselves compounded of simpler things. The word atom means the thing that cannot be cut. It is a very ancient word, going back hundreds of years before the birth of Christ. Little more than a century ago, a great Englishman, John Dalton, gave the word a new importance by his study of the way in which compounds like water are made, and showed that the atoms which the Greeks dreamed and guessed about must really exist. Everyone now agrees that there can be no doubt as to that. But since Dalton's time almost everyone has thought that an atom is what its name implies—a thing which cannot be cut or divided.

This would mean, of course, that the element—being made of atoms—was really an element; while if an atom could be divided, let us say, into two different parts, then the element would really be, after all, a sort of compound. It is not so long ago since some of the greatest chemists then living were quite certain that all

atoms are simple things which cannot be divided up, or analysed, as we say, any farther. They were very definite and much too positive in what they said about atoms. They told us that all matter everywhere, on the earth and in the heavens, is made of these seventy-five or eighty different kinds of atoms; that these atoms can neither be made nor destroyed; that they are the everlasting stones of which the world is made; that they have existed unbroken and unworn since first they were minted by the hand of God; and that they go on exisiting without change or wear for ever.

THE MAKER AND SUSTAINER OF ALL THINGS IN THE WORLD

This was, after all, just the same idea of the way in which God works as men used to hold about the different kinds of animals and plants. They thought of God as a sort of great manufacturer or watchmaker, instead of thinking of Him as the Being to whom all the changes and life and movement of the world are due *now*, and have always been due. He did not make the world once upon a day, but He is ever and *now* making and changing and sustaining the world. It is He who works when radium gives birth to helium or neon.

Not until you have grown up and thought long about these wonderful questions can you see how immeasurably grander and more worthy of Him and of us is this idea of God and the way He works, than the idea that once He made the world as a man makes a clock, and that ever since He has been sitting in the clouds looking at it. If He is not everywhere He is nowhere; but He *is* everywhere. Some will say, perhaps, that these are not questions which should come into our story of the earth. But the most splendid and valuable thing about our knowledge of the earth to-day is that, while helping us in our ordinary life, it does lead us to a higher and wider and nobler idea of God.

THE REAL DIFFERENCE BETWEEN ONE ATOM AND ANOTHER

Now let us look more closely at the atom. We are quite sure now that atoms are themselves compound things, and the question, of course, is: what are they made of? For instance, are the atoms of oxygen made of parts which are peculiar to atoms of oxygen, and quite different from the parts which make up an atom of gold or an atom of hydrogen? If this were so, as it might be, then, even though we had found out the parts of which atoms are made, yet we should still have to accept the idea that all matter is made up of seventy-five or eighty different kinds, the brick we call a hydrogen atom being made up of smaller bricks or bricklets which were hydrogen bricklets and quite different from those making up any other kind of atom. Well, that is not what we find. On the contrary, we find that the parts which make up one kind of atom are exactly the same as the parts which make up a different kind of atom; only the number of these parts and the way in which they are arranged vary in different kinds of atoms, and that is what makes them different.

If we look first at the large atoms which have been most studied, especially the atoms of radium, we find that, as they break up—owing to reasons which we do not yet understand—they produce, among other things, smaller atoms.

HOW WE ARE FINDING OUT WHAT AN ATOM IS MADE OF

Now, that tells us a great deal about the relation between one kind of atom and another, but it does not tell us what an atom is really made of. However, there is something else produced when the radium atom breaks up, and it is this something else which has rightly attracted more attention and interest, during the last twelve years or so, than any other thing in the whole of Nature.

This thing, or rather these things—for they exist in countless numbers—do not belong only to the atom of radium, though they are more easily studied in radium, because it produces them quickly.

We are now learning that whenever and wherever we look for these things in the right way, we find them; not radium atoms only, but atoms in general produce them. The great group of metals, we learned some time ago, produce them in abundance. They are much more easily detected in some cases than in others, but as the years go on there remains little doubt that these things are being produced, slowly or quickly, by all kinds of matter everywhere. Indeed, we may now go a step farther, and say that matter is mainly, if not entirely, made of them. Only

thirty years ago it would have seemed absurd to ask what atoms are made of, and still more absurd to try to answer it. But now we can rightly ask this question, and have gone far towards answering it.

We have already seen that atoms are not permanent things, after all; but that, like everything else in the world, they change. It is in the course of this change, as we watch it, that we learn what atoms are made of. Whatever the kind of atom we study, whether radium, or some metal, or a gas, we find that in the course of its change it gives out from itself certain things which are all just like each other, and which are just the same, whatever kind of atom they come from. These things do not make up the whole atom, but they constitute a most important and essential part of it, and we cannot know too much about them.

WE MUST NOT LET THE GREAT MUDDLE OF WORDS MISLEAD US

But if we are to understand them, we must look at one or two words, for many of the words we use nowadays have rather muddled meanings. At a future time we shall have to study heat, and there we shall learn that this simple word, "heat," is used for two quite different things, though only the very wisest of those who study it have yet noticed how their word is deceiving them. Sitting opposite the fire, we feel it hot. Now, we know that it is because the fire is sending out certain waves, really just the same as light waves, but invisible to the eye, though felt by the skin. These are heat waves or rays, or radiant heat. They have no matter in them any more than light has, but, like light, are waves in the ether. But when we take a hot piece of matter, like a stone that has been lying in the sun, we say that there is heat in it; it feels warm to our fingers; and the heat in it is due to the radiant heat that has struck it.

But the heat of this stone is utterly different, though it feels the same to us, from the heat rays of sunshine. It is a state of to-and-fro movement of the atoms which make up the stone—a to-and-fro movement of matter. Yet at present, because only few have thought about this, and because the effect on our skin is much the same in both cases, we apply one and the same word, heat, to two wholly different things—a wave in the ether and a to-and-fro motion of the atoms of matter.

THE THINGS OF WHICH ATOMS ARE MADE ARE A KIND OF ELECTRICITY

Now, we have begun with this instance because it is a very striking one which anyone can understand, and because it is exactly the same as the use of another well-known word, electricity; and we are about to learn that the things which come out of breaking-up atoms, and of which atoms are made, are a kind of electricity. But we shall get into a sad muddle if we are not careful as to what we mean by that word. It has long been one of the most important words in science, but within the last ten years it has become a thousand times more important than ever before. If we use it wrongly, or do not know what we really mean by it, we shall make countless mistakes.

Long years ago it was found that if we rub a piece of amber—the beautiful yellow stuff of which the stems of pipes are often made—it will attract light things to it; and the force which acts in this way was called electricity, from *electron*, the Greek name for amber. That was merely a curiosity for a long time, but then electric forces were found elsewhere, and now we are all more or less familiar with the electric current. "Current" means *running*, and electricity is something which runs or moves. In the case of the amber attracting a piece of light wood, it is something that moves across the air between the amber and the wood. When we light our houses by means of the electric current, it is something that runs or moves along a wire. This something also runs along much longer wires when we send telegrams.

WHAT IS IT THAT RUNS THROUGH SPACE WHEN WE SEND A TELEGRAM?

Lately we have learned that wires are not necessary, but that whatever it is which runs will run through space without any wires at all. Every day now electric currents are being sent from this country to Europe, and from Europe to us. What is it, then, that runs or moves?

It is exactly like light—*a wave in the ether*. It is not conveyed by the air in wireless telegraphy, but by the ether which is everywhere, though we cannot

see it. Its waves are bigger waves than those of visible light, just as the sound waves made by a low note of the piano are bigger waves than those made by a high note. But electric waves are of exactly the same kind as light waves: they move in the same ether; they move at exactly the same rate; they follow exactly the same laws in all respects.

THE TWO KINDS OF WAVES THAT WE CALL ELECTRICITY

We think there is a great difference between the two kinds of waves because we can see the one sort and not the other. But that is merely due to the limitations of our eyes; indeed, it is due to just the same reason that prevents us from seeing the rays of radiant heat. Now, electric waves, heat waves, and light waves are all known to be essentially one and the same thing, just as the lowest note and the highest note on the piano, though they are so different, are both sound. We understand that because we have one sense, the ear, which tells us of both notes.

Now, we saw that the word heat is applied both to radiant heat or heat waves, and also to a particular state of the atoms of matter in which they are swinging to and fro in anything—a state which gives our skins much the same impression as radiant heat does. We must now learn that the word electricity is also used, at present, for two quite different things. This makes grave confusion, and leads to many mistakes. It cannot be defended, and it is a great pity that we should have to put up with this confusion. It will not always be so, but at present people are very careless about words, and we must just make the best of this muddle. Let us remember that electricity, like heat, means two quite different things. Now we shall see the importance of all this.

ELECTRONS, THE WONDERFUL THINGS THAT COME OUT OF ATOMS

The name given to the things which come out of atoms, and which make up atoms, is *electrons*. They are described as particles or *atoms of electricity*, and this last phrase, which will probably be more and more used, is the best example I know of the way in which words are apt to be muddled. Just think for a moment. The waves of wireless telegraphy are waves of electricity, just like waves of light. Now, a wave is not a *thing* exactly, but a *state* of something else. A wave of the sea is not one of the things that make the sea, but is *a state of the sea*. It is absurd to talk of an atom of a wave of any kind, and no one can talk of atoms of light. On the other hand, for a hundred years we have been using the word atom to mean the small units that make up the elements of matter; and now we are asked to use the same word in order to describe different things inside these atoms!

So we see that words are being used in two meanings. When we say that electrons are atoms of electricity, we mean that they are tiny particles of something which is not in the least like the electric waves that go across the Atlantic, any more than the heat of a stone is like the waves of radiant heat. But there is the best of all reasons in the world for calling these things atoms, if only we had not, when we knew less than we do now, used up this word for something else. Atom means a thing that cannot be cut, or divided, or split up. The chemical atoms, like an atom of oxygen or gold, were thought to answer to this description.

THE SIMPLEST FORM OF THE MATTER OF WHICH THE WORLD IS MADE

We know now that they do not. But this new kind of atoms, which are usually called electrons, and which go to make up what we have been calling atoms for so many years, are really worthy of the name. They are entitled to be called atoms, for they are really atomic; they *are* simple; they cannot be divided; they have no different parts in them; they answer exactly to what the word atom suggests.

Let us now look at some of their properties, meanwhile trying to remember that we are at last studying the matter of which the earth and the heavenly bodies are made, in its very simplest form. Wherever matter is, there these electrons are; they are in this page before us, in the air we breathe, in the sun and the stars. They are the true units, the real atoms of matter, and help us to understand the meaning of Tennyson, when he said that there must be "one element" of which all the various things we call elements are made.

The next story of the Earth begins on 1553.

THE STORY OF THE BIRDS

WE come now, in our story of Animal Life, to the great family of birds. Nature's richest gift to the animal world was the gift of flight to the reptiles which became birds. The hideous monsters that first began to fly, with great toothed beaks and scaly, tufted tails, have all perished. Some flying animals remain still, sailing on outstretched rafts of muscle; and there are fish in the ocean which, leaping from the waves, sail far and fast by the aid of wing-like fins. But true flight belongs only to the birds and the bats. The bats skulk through the air at nights as if ashamed of their strange performance; but the birds fill the air with life and song from early morning till the sun goes down, as if to show that nowhere beneath the clouds is there a place where Nature's children may not flourish and be happy.

BIRDS THAT CANNOT FLY

CONTINUED FROM 1382

ALTHOUGH we ourselves cannot fly, we are able, in a general way, to understand what happens when a bird flies. The wings of the bird displace the air with every beat they make. They force the air downwards and backwards. But every time the air resists before giving way; it resists all the time that it is being pressed by the wings, and that resistance of the air enables the bird to rise. It is the resistance of the water to our strokes that enables us to swim; it is the resistance of the water to the screw-propeller that causes the big ship to be driven through the waves; and it is the resistance of the air to the bird's wings when pressed down that causes the bird to rise in the air and to go forward.

In order that the bird may exert this downward and forward pressure it has enormous muscles. The muscles of the flying birds are far bigger, considering their size, than the finest muscle of a giant man. The strongest muscle of the bird is that which pulls the wings down. That is the flesh on the breast of the bird. It is attached to a breast-bone shaped like the keel of a ship. But when the wings have come down, they have to be drawn up again ready for the next stroke. This drawing up of the wings is done by two smaller muscles hidden in the flesh of the breast. The great muscle of the breast is also attached to the under side of the wings, to draw them down and to cause the bird to rise and go forward. The smaller muscles are continued into strong tendons which pass through a hole in each shoulder-joint, and are fixed to the upper side of the wings, so that these may be raised when the downward stroke has been made.

All these muscles work in turn to enable a bird to change the position of its wings so that it may catch the breeze, and sail or hover; or, of course, to turn in a new direction. When the wings are forced down, all the feathers are spread out flat to prevent the air from passing between them; but when the wings are being raised, the feathers open out to let the air pass through, so preventing the bird from being tired by too great an effort to force up its wings against the pressure of the air. Thus we see that the action of a bird's wings is controlled by the most wonderful and perfect living machinery.

There are other aids to flying which a bird possesses. It has an oil-gland from which it draws oil to lubricate its feathers. This is specially valuable to sea birds, which must have their feathers water-tight; but it is of service to the birds of the air also, for the oil upon their feathers makes them less porous, and causes them to offer a greater resistance to the air when they are making the important downward-forward stroke.

Another important thing is the system of air-vessels, or air-sacs, with which a bird is provided. The bird has huge lungs, but beyond these run the air-sacs, some birds having them

continued right into their bones. It was at one time supposed that these sacs were filled with gas, to make the bird light, as gas makes a balloon light. That is not the fact. These air-sacs do help to make the bird lighter, but not through gas. The air in them is warmed by the great heat of the bird's body, and as hot air is lighter than cold air, so the presence of a quantity of warmed air in the body of the bird must help to sustain it in its flight.

BIRDS THAT CANNOT FLY, AND ARE SLOWLY DISAPPEARING

Seeing how great is the perfection to which flying birds have attained, so that they can fly from country to country in the course of a single night, and race the fastest ships and trains, we may wonder that all birds do not fly. Some, however, forgot how to fly so long ago that there is now very little evidence of their ever having flown.

The greatest of all birds, the moa, which lived chiefly in New Zealand, but also to some extent in Australia, had no wings at all. There are no moas left alive now. They were hunted by the natives until not one moa survived. They were plentiful up to the middle of the eighteenth century, and some natives of New Zealand, who were in England fifty years ago, told stories of their grandfathers having hunted the giant bird. There were some small varieties of moas, but the giants of the family were fourteen to sixteen feet high—taller than the tallest elephant, and as tall as a good-sized giraffe. They had enormously thick legs and toes, the bones being like those of an elephant. But they are all gone, and the other birds which cannot fly are in danger of following them into extinction. Madagascar's great bird, the æpyornis, which laid an egg a yard in length and two feet six inches round, which could hold more than two gallons, is, like the moa, as dead as the dodo.

HOW THE FLIGHTLESS BIRDS LOST THE USE OF THEIR WINGS

It is probable that all the great flightless birds of our day descended from birds which could fly, though there are in the wing of the ostrich the slender claws of a limb which suggest that the ostrich's wings were, once upon a time, not wings at all, but the supports of a four-footed animal. Be that as it may, there is little doubt that the moa, the ostrich, the cassowary, the apteryx, the rhea, the emu, and the penguin all started fairly like the other birds, and had their chance with them. But early in their history we find the old story repeated.

Most birds had to fly to pursue their food, or to escape flesh-eating enemies. They had a hard life of it then, and, making the best of it, they gradually developed wings and learned to fly. The birds which do not fly descend from birds which found pleasanter quarters, where food was abundant on the ground, and where there were no savage beasts to kill them. Although they had learned to fly, they had now no need to do so. They neglected the use of their wings.

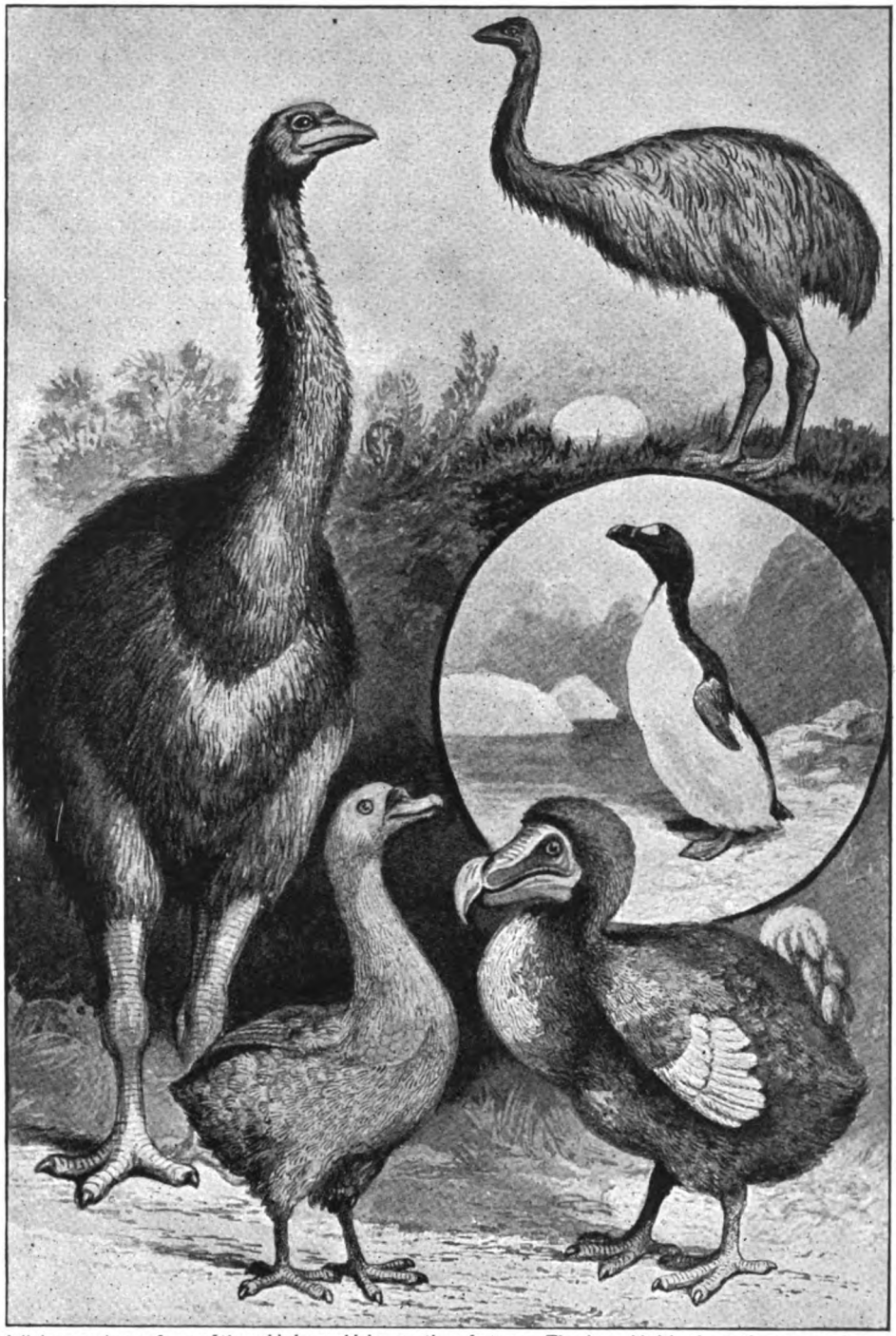
Slowly, in the course of long ages, the wings lost their power to raise them above the ground. The wings got smaller and smaller, until to-day, in the case of the ostrich, they serve only to balance the bird as it runs, in the same way that hands serve to balance us when we walk and run.

THE OSTRICH, WHICH RUNS LIKE AN EXPRESS TRAIN INSTEAD OF FLYING

When we think of this we must remember that the wings of all birds, big or little, flying or flightless, are only hands which have been changed into wings. They had arms, and wrists, and hands, and fingers, just as we have. But these changed and became covered with feathers, to form the wonderful instruments which carry the flying birds up into the clouds.

The most famous of the birds which do not fly now alive is the ostrich, because it is the biggest, and gives the best feathers. It differs from the other big birds because these have three toes—indeed, one has four—while the ostrich has only two toes. Its home is in Africa and Arabia, but it used to live in India, and the egg of one has been discovered, very, very old, in Southern Russia. The height of the ostrich is between six and eight feet, the neck being long and flexible. When wild, it shuns men, and prefers the company of giraffes and zebras and deer. As it has lost the power of its wings, it has developed the power of its legs. These are very thick and strong. When it begins to run, it races away like an express train, at the rate of

SOME BIRDS THAT FORGOT HOW TO FLY



A living specimen of any of these birds would be worth a fortune. The huge bird is the extinct moa. It was taller than an elephant. The bird which looks like an emu is the extinct æpyornis. Its egg would hold two gallons. The penguin-like bird is the great auk. There is not now one living in all the world. The dodos lived and died in Mauritius, where sailors ate them. They were the biggest pigeons in the world, larger than a swan. The solitaire looks like a tiny-winged goose, but was a pigeon. All these birds forgot how to fly, and perished.

sixty miles an hour. Of course, it cannot keep this up, but even when its first freshness has worn off it can outrun a good horse, unless the man upon the horse's back knows how to hunt it.

THE SILLY STORIES OF THE OSTRICH TOLD IN THE SCHOOL BOOKS

The ostrich does not run straight, but in curves, so the hunter, by taking short cuts, can get up to it. Then the ostrich, if it be a male, will fight. Its feet are its weapons. You may judge how strong are its feet and legs when you know that the ostrich can carry two men on its back. It strikes forward with its feet, and can inflict a terrible injury. This shows us how unreal are the stories in the school books of the ostrich running away and burying its head in the sand as soon as it sees an enemy, believing that because it cannot see neither can it be seen. The ostrich does no such thing; nor does it leave its eggs to be hatched by the sun.

Stupid the ostrich may be, but it makes a very good parent. Three or four hens lay their eggs together in a rough nest, which is made simply by a hollow in the sand. The ostrich's egg is very big, but the male ostrich is a big bird, and can cover sixteen of them. If there be more than that, he simply pushes them out of the nest, and frequently more wasted eggs are found lying about the nest than have been hatched. The hatching lasts forty-two days. The birds do not leave the eggs in the sand. The male sits on them throughout the night, and the hen sits on them during the day. Sometimes the hen may cover the eggs over with sand, and leave them in the sunshine for a few hours during the day, but this rarely happens.

WHEN THE YOUNG OSTRICHES COME OUT OF THE EGGS AND BEGIN TO EAT STONES

The birds have sense enough to know that if left unprotected the eggs would be fried or boiled by the sun, so they use sand as a shield when leaving them. When the chicks are hatched, they eat nothing but a few stones for the first two or three days. When they are able to run about, the father bird guards them affectionately.

Many ostriches are tamed and kept on ostrich farms, in Africa, in Southern France, and in California. The big ostriches are wanted for their feathers.

At certain periods of the year the birds are collected together, and taken one by one into big yards to have some of their feathers removed. Eighteen or twenty long white feathers are cut from each wing; then eight or nine fancy feathers, and a few long black ones, and some short feathers. The bird suffers no pain. If it did, it would take a fever and die. Nor are more feathers removed than the ostrich can spare, for in that case the bird would be cold, and die. The business of the ostrich farmer is to keep his birds in good health, and it pays him to be kind.

Ostriches are to be seen in nearly all the zoological gardens. There they eat the most extraordinary things. One ostrich, which died, was found to have swallowed many large stones, seven nails, a scarf-pin, an envelope, thirteen copper coins, a silver coin, fourteen beads, two small keys, a part of a handkerchief, a silver medal, and a small metal cross. This one did not die from what it had eaten, but one which swallowed part of a parasol did.

THE RHEA BIRD, WHICH STOLE PART OF A RAILWAY IN SOUTH AMERICA

A bird which much resembles the ostrich is the rhea. It has three toes, but is so like the other bird that it is called the South American ostrich. It lives only in South America. In nothing else does it more resemble the ostrich than in its appetite. It will eat almost anything which can be picked up. When a railway was being built in the wilds of South America, there was quite a famine of steel nuts and bolts; the rheas used to creep up to the works and steal all that they could find. Of course, in such a big place as South America, the rheas are not all alike. Some lay quite small eggs; others lay large eggs. Some have horny crests to the head, like the cassowary.

When the families of the rheas are being made up, they have battles, like the giraffes. The young males are driven away, then the old ones fight among themselves for the females which they desire to possess. They twist their long necks together, and bite as hard as they can, kicking and stamping all the while, as they prance round in a circle. When an ostrich kicks an ostrich, or when a rhea kicks a rhea, not much damage is done. Use and nature have made them ready for such treatment.

THE OSTRICH, WHICH CAN RACE A HORSE

Ostriches gained their present shape when there were no enemies from which they could not escape by running. They never learned to fly. They can run faster than a horse; but their wings are small, and serve only to balance the body as they race over the ground. The ostrich has at the end of its wing-bones two slender claws, which are believed to be remnants of front limbs which its ancestor had when it existed as a four-legged animal.

The kicks of these birds do most damage to different types of creatures. When the battles are over, and all is peace, the female rheas lay their eggs in holes, like those made by ostriches. In a single nest all the eggs of the party are laid, or as many as the male bird permits. If the male bird be good-tempered, scores of eggs will be deposited. In one instance, over a hundred eggs were found in the same nest. Of course, not nearly all these can be hatched in one nest, so generally the male rhea drives away the hens before they have finished laying. Then he sits on the eggs till they are hatched.

When hatched, the young rheas are often in peril from eagles and other big birds of prey, which swoop down to carry them off. But the male rhea is a watchful as well as loving father. As soon as he sees a bird of prey appear in the sky, he crouches down and utters a snorting cry. The young ones rush to him for protection, and he shelters them under his wings.

THE CASSOWARY THAT CAME FROM THE FOREST AND FOUGHT TWO BLOODHOUNDS

A near relation of the rhea and ostrich is the cassowary, a flightless bird five feet high. Upon its head is a crest of horn, and at the sides of the face are coloured wattles, which make its appearance, so far as the head is concerned, more attractive than that of the ostrich. It has, however, not the rich plumage of the ostrich, but feathers which are more like hair. Upon its stumpy wings are five spiny quills, and the cassowary strikes with these when it fights. But its strong, three-toed feet are its chief weapons.

Not long ago, a gentleman was resting in the middle of the day near a forest in New Guinea, when a cassowary stalked forth. Two big bloodhounds which he had with him immediately attacked the bird, but it was not in the least afraid of the powerful brutes. It struck out left and right with its terrible feet, and soon stretched one of the hounds dead upon the ground. The other hound tore open the flesh of the cassowary's breast, but the bird continued to fight, and would have killed the dog, too, had not the man at last succeeded in putting an end to the fight. Being a kind man, the traveller stitched up the wound of the cassowary, gave it a good meal, and let it go. It went quietly back to the forest as if none the worse for its battle.

HOW THE FATHER AND MOTHER EMU BIRDS ATTEND TO THEIR LITTLE ONES

Australia has a cassowary called the emu, which, though its body resembles that of the other, has no helmet and no coloured wattles. But it has a feathered neck and head, which these other big birds have not. It is about six feet high when full grown. The male emu has only one mate. She lays about forty eggs in the course of the summer, but the male bird does not wait until all these have been laid. He makes a nest and sits on it as soon as the first batch of eggs is ready. The hen continues to lay, and then she sits on the rest. Meanwhile, the male emu has hatched the first batch, and is able to look after the little ones while the mother bird hatches the rest. In spite of their many eggs, the rheas and cassowaries are getting very scarce. A cruel man with a rifle can, in the course of a day, shoot many parent birds and their broods.

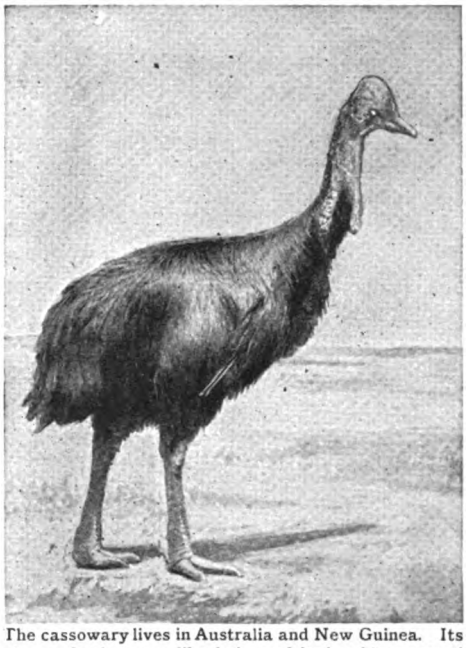
The nearest resemblance remaining to us to-day of the great moa is the apteryx, or kiwi, shown on page 1431. It is a bird which has no tail, and scarcely any wings, but has thick legs and four-toed feet, with which it can kick with great force. The stout claws on three of the toes make these weapons still more powerful.

THE KIWI BIRD, THE DODO, AND THE GREAT AUK

This bird never grows to more than three feet in height, and it is not a quarter the size of the moa. It differs in this respect, too—it has a long, thick beak. Its nostrils are not at the base of the beak, as is the case with other birds, but just near the tip. This is to enable it to smell its food. It lives upon worms and grubs, and insects and berries; and, though it comes out only in the dark, its presence can be detected by the sniffing noise it makes in seeking its food. The apteryx lays an enormous egg.

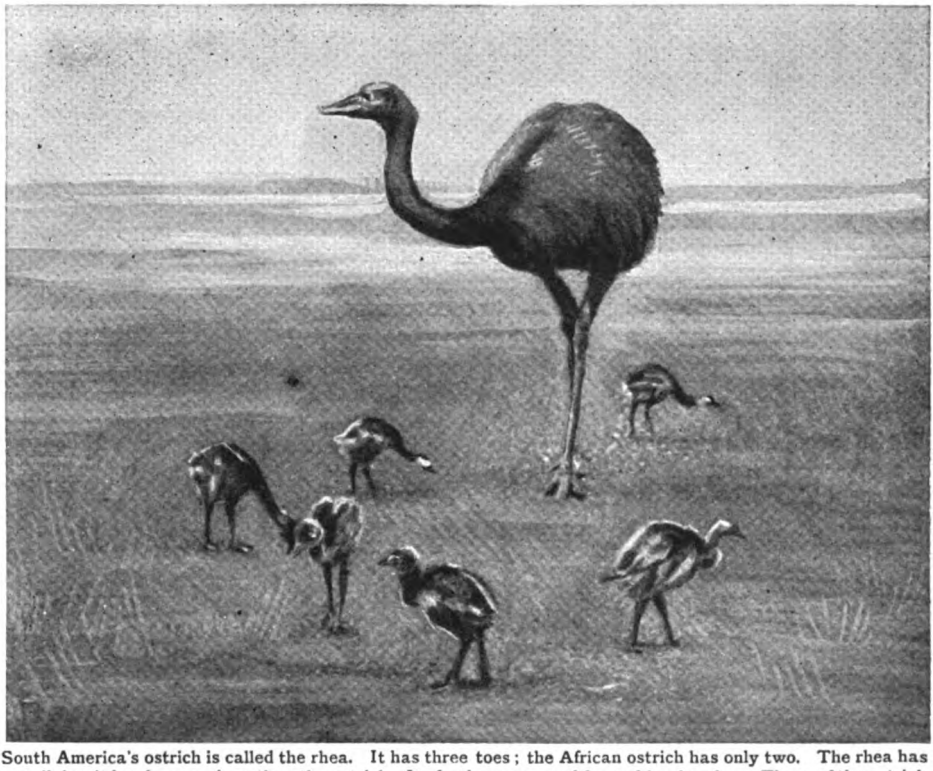
The dodo and the great auk were flightless birds, which became extinct in comparatively modern times. There were thousands of dodos in Mauritius until the Dutch settled there. The dodo was a pigeon, as big as a turkey, but could not escape when enemies attacked it,

THE COUSINS OF THE OSTRICH



The cassowary lives in Australia and New Guinea. Its glossy feathers are like hair, and its head is crowned with a helmet. The male is smaller than the female.

The emu is a kind of cassowary. Its neck is feathered, not bare like the cassowary's. The female emu is bigger and fiercer than the male.



South America's ostrich is called the rhea. It has three toes; the African ostrich has only two. The rhea has no tail, but it has larger wings than the ostrich. Its feathers are used for making brushes. Those of the ostrich are more valuable, and the ostrich is carefully reared by ostrich farmers for the sake of its feathers. These big birds have strange appetites, and eat all sorts of things from screws to broken bottles and seem none the worse.

owing to the smallness and weakness of its wings. It was good for food, so the settlers ate the big birds, while their dogs and pigs destroyed the little ones and their eggs. To-day, even the skin and feathers of a dodo would be worth a fortune. A complete specimen of the great auk would be nearly as valuable. The great auk was a bird which lost its power to fly and developed wings that could be used as paddles in the sea. There were millions of great auks in northern parts of the world, but men killed them all, and to-day an auk's empty eggshell is worth hundreds of pounds.

We shall probably see another of the flightless birds disappear as these others have done. The penguin, the curious sea bird which marches upright, with little paddles for wings, is slain in hundreds of thousands. Its home is in the Antarctic regions, where it nests on the ground in companies; but all its food is caught in the sea. There is no doubt that once upon a time it could fly as well as any other sea bird.

THE COMICAL PENGUIN, WHICH USES ITS WINGS TO SWIM WITH

But ages and ages of neglect to use the power to fly brought the usual result. The form and purpose of the wing became changed. Instead of long feathers for flying, the penguin's wing now has only short, scaly feathers. It cannot be moved and doubled, as can that of a flying bird.

The penguin can walk on land, slowly, and with stately step, which gives it the most comically grave appearance; but to swim is its easiest way. Once on the water it stretches out its legs behind it, and works its wings, one after another, as a man in his canoe works his paddle. The penguin would never have forgotten how to fly had it had enemies in the beginning as it has now, men who can go in ships to the lonely islands where it breeds.

Through long ages of safety it has become a stupid bird, and fearlessly lets a man approach. When he gets up to it, it may give him a peck severe enough to make him glad to put on leggings; but what is a peck on the leg to a man who has a gun or a stick with which he can knock down as many birds as he wants? He gets oil from the body of the bird, and sells the plumes about its neck to furriers, who make them into various articles of dress for women to wear.

In some parts of the world the penguin is protected by law, but in others cruel men kill it at such a rate that soon the penguin colonies will be desolated, as are the haunts of the moa, the dodo, and that other great wingless, dodo-like bird, the solitaire.

WHY THE FLIGHTLESS BIRDS CAN NEVER FLY AGAIN

If birds could live through millions of years of persecution, doubtless ostriches and their cousins, and the penguins, and the kakapo, or owl-parrot, of New Zealand, which can climb but not fly, and the steamer-duck, which can swim but not fly, and the New Zealand wood-hen, another of the flightless birds — doubtless all these would develop into flying birds. But there is no chance of that now. The flightless birds have lost that keel-like bone in the breast which all the flying birds have. It takes too long for a bird or an animal now to make so great a bodily change as this, and men's habitations spread so rapidly about the earth that the place of these great wild birds will soon know them no more.

Long, long ago, these birds chose the easy life where no enemies were, and now, poor things, they are paying the penalty with their lives.

It is very sad, for there are other birds which are slowly losing their flying powers. The hoatzin, a strange South American bird, which lives always in trees overhanging water, has been so long without occasion to fly that it can now only flutter a little way.

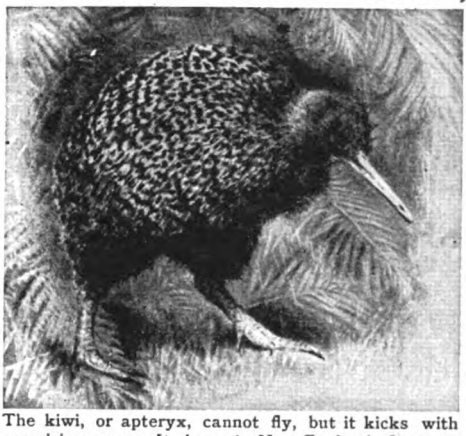
THE WONDERFUL POWER OF THE LITTLE BABY HOATZIN BIRDS

It is interesting because, when a chick, the hoatzin still has claws on its wings, like the first reptile birds had millions of years ago. With these, the tiny young ones can climb up the sides of the nest so as to receive the food which their parents bring.

When the wings grow long enough for the little one to flutter alone, the claws disappear. Should the baby hoatzin by any accident fall into the water, it dives and swims from danger in a marvellous way. So far as is known, the adult hoatzin cannot swim. It is rather a helpless bird when it grows up—all through living too easy a life.

The next stories of Birds are on page 1513.

BIRDS THAT RUN, SWIM, OR CLIMB



The kiwi, or apteryx, cannot fly, but it kicks with surprising power. Its home is New Zealand. It comes out only at night, and digs up food with its long beak.

The black wood-hen, or weka rail, of New Zealand, cannot fly, but can run fast along the ground. It hates the sight of red, and will fight wildly if it sees this colour.

The wing of the penguin has become simply a flipper or paddle, and the bird cannot fly. When on land penguins walk upright and clumsily. They suffer dreadfully from the hunters, who want them to boil down for oil. They leave the sea for the land to lay their eggs, and are then slain in thousands. They are most at home in water.

The hoatzin flies with difficulty. The young ones have claws on their wings before the feathers come, and they can climb. They can swim and dive, too, but not when they grow up. It is a living fossil among birds.

The kakapo, or owl-parrot, long led such an easy life in New Zealand that it ceased to fly. Now it must climb trees like four-footed animals, and come out early at night for its food. Its colour is greenish and brown.

The photographs in these pages are by Lewis Medland and others

THE FAIRY'S REVENGE

An old shepherd was playing on a flute one morning as he watched his sheep on the marshlands outside Rome, and he played so sweetly that a lovely fairy came and listened to him.

"Will you marry me, and come and play to me in my castle under the earth?" she said.

"Yes, yes, lovely lady!" said the shepherd. She put a ring on his finger, and he at once became a handsome youth dressed in princely robes.

"But I must first go to Rome and bid farewell to my friends and relatives," he said.

The fairy gave him a golden coach and twelve white horses, and as he rode in state to Rome he met the young and unmarried Queen of Italy. She was struck by his wonderful beauty, and invited him into her palace. The shepherd saw that he had won the queen's heart, and he resolved to marry her and become King of Italy, and let the fairy go. So when he and the queen were alone together, he knelt down and took her hand, saying:

"Marry me, dearest, and I will help you to govern Italy."

But as soon as he spoke he turned into an old, ugly, and ragged shepherd.

"What is this horrible beggar doing here?" cried the queen. "Whip him out of the palace."

And this was done. The miserable shepherd went back to the marshlands to find the fairy, but she never came to him again, and so he remained a shepherd.

THE MINSTREL QUEEN OF SPAIN

A long time ago the fierce Moors invaded Spain, and defeated the Spaniards and captured their king. The lovely Queen of Spain at once dressed herself in boy's clothes and went to the tent of the Moorish chieftain, and sang to him as he sat feasting.

"What a divine voice!" said the Moor. "Boy, you shall have a royal footstool!"

He forced the King of Spain down on the ground, and the singer put her feet softly on his neck. When the singing was done, the Moor cried:

"Boy, you sing like an angel! Ask what you will, and I will grant it."

"Let me take this young king back to his people," said the singer.

Her request was granted, so she led the king into the northern mountains, and there they met the Spanish Minister.

"Sire, you must marry again," he said. "Your queen has joined our enemies."

A feast was held, and the cunning Minister put his daughter next to the king, and she made love to him. But the king turned sadly away from her, and said to the singer:

"Boy, sing me something merry."

And the singer sang:

"Down the hills and along the plain,
Lute in hand went the Queen of Spain,
Dressed in the clothes of a boy she went
And sang in the Moorish chieftain's tent.
He gave her a footstool fair and strong,
And she won the footstool with a song."

The King of Spain then recognised his wife. He took her tenderly in his arms, and had the cunning Minister punished. In the end the Moors were defeated and driven out of Spain.

THE CHOICE OF MARPESSA

Marpessa was the loveliest of all the princesses of ancient Greece, and he was wooed by Idas, a noble young hero, and Apollo, the radiant "god of the sun." Idas was the bolder lover, and one day he carried Marpessa away in his chariot; but Apollo then came down from the sky and stopped him, and Marpessa then had to choose between the man and the god. Apollo was more beautiful than Idas, and he felt sure that Marpessa would marry him; but Marpessa said, "No, Apollo! You are immortal, and will remain ever young and happy. But Idas will grow old as I grow old, and share my troubles, and cherish and comfort me."

So she married Idas, and they lived as happily together in their old age as they did in the flower of their youth; and they had many tall, handsome children to love and help them in the decline of their life.

JOHN RUSKIN'S FAIRY STORY

JOHN RUSKIN was one of the wisest and cleverest men who ever lived. He was a writer of beautiful books, an artist, and a teacher. He had a great passion for truth and gentleness, and a great hate of anything unjust and false. We read in another part of our book of the life of John Ruskin, and of what he believed and taught. But once during his life John Ruskin did an odd thing: he wrote a fairy tale to please a girl friend who had come to stay at his home. It seemed to her that so wise a man could not write a simple fairy tale, but Mr. Ruskin's fairy tale, which he sat down to write on one day and finished on the second day, is one of the finest tales in the world, and shows us how much truth and wisdom can be put into a simple story. The story begins in these pages and ends on page 1534. It is not quite all given here, but the little left out does not make any difference.

THE KING OF THE GOLDEN RIVER

CONTINUED FROM 1326

IN a secluded and mountainous part of Styria there was, in old time, a valley of the most surprising and luxuriant fertility. It was surrounded on all sides by steep and rocky mountains, rising into peaks, which were always covered with snow, and from which a number of torrents descended in constant cataracts. One of these fell westward, over the face of a crag so high that when the sun had set to everything else, and all below was darkness, his beams still shone upon this waterfall, so that it looked like a shower of gold. It was therefore called, by the people of the neighbourhood, the Golden River.

It was strange that none of these streams fell into the valley itself. They all descended on the other side of the mountains, and wound away through broad plains and by populous cities. But the clouds were drawn so constantly to the snowy hills, and rested so softly in the circular hollow, that in time of drought and heat, when all the country round was burnt up, there was still rain in the little valley; and its crops were so heavy, and its hay so high, and its apples so red, and its grapes so blue, and its wine so rich, and its honey so sweet, that it was a marvel to everyone who beheld it, and was commonly called the Treasure Valley.

The whole of this little valley belonged to three brothers, called Schwartz, Hans and Gluck. Schwartz and Hans, the two elder brothers, were very ugly men, with overhanging eyebrows and small, dull eyes, which were always half shut, so that you couldn't see into *them*, and always fancied they saw very far into *you*.

They lived by farming the Treasure Valley, and very good farmers they were. They killed everything that did not pay for its eating. They shot the blackbirds, because they pecked the fruit; and killed the hedgehogs, lest they should suck the cows; they poisoned the crickets for eating the crumbs in the kitchen; and smothered the cicadas, which used to sing all summer in the lime-trees. They worked their servants without any wages, till they would not work any more, and then quarrelled with them, and turned them out of doors without paying them.

It would have been very odd if, with such a farm and such a system of farming, they hadn't got very rich; and very rich they *did* get. They generally contrived to keep their corn by them till it was very dear, and then sell it for twice its value; they had heaps of gold lying about on their floors, yet it was never known that they had given so much as a penny or a crust in charity; they were of so cruel and grinding a temper as to receive, from all those with whom they had any dealings, the nickname of the "Black Brothers."

The youngest brother, Gluck, was as completely opposed, in both appearance and character, to his seniors as could possibly be imagined or desired. He was not above twelve years old,

fair, blue-eyed, and kind in temper to every living thing. He did not, of course, agree particularly well with his brothers, or rather they did not agree with *him*. He was usually appointed to the honourable office of turnspit, when there was anything to roast, which was not often; at other times he used to clean the shoes, the floors, and sometimes the plates, occasionally getting what was left on them, by way of encouragement, and a wholesome quantity of dry blows, by way of education.

Things went on in this manner for a long time. At last came a very wet summer, and everything went wrong in the country around. The hay had hardly been got in, when the haystacks were floated bodily down to the sea by a flood; the vines were cut to pieces with the hail; the corn was all killed by a black blight; only in the Treasure Valley, as usual, all was safe. As it had rain when there was rain nowhere else, so it had sun when there was sun nowhere else.

It was drawing towards winter, and very cold weather, when one day the two elder brothers had gone out, with their usual warning to little Gluck, who was left to mind the roast, that he was to let nobody in, and give nothing out. Gluck sat down quite close to the fire, for it was raining very hard, and the kitchen walls were by no means dry or comfortable looking. He turned and turned, and the roast got nice and brown.

"What a pity," thought Gluck, "my brothers never ask anybody to dinner! I'm sure, when they've got such a nice piece of mutton as this, and nobody else has got so much as a piece of dry bread, it would do their hearts good to have somebody to eat it with them."

Just as he spoke there came a double knock at the house door, yet heavy and dull, as though the knocker had been tied up—more like a puff than a knock.

"It must be the wind," said Gluck; "nobody else would venture to knock double knocks at our door."

No; it wasn't the wind: there it came again very hard, and, what was particularly astounding, the knocker seemed to be in a hurry, and not to be in the least afraid of the consequences. Gluck went to the window, opened it, and put his head out to see who was standing there in the rain.

It was the most extraordinary-looking little gentleman he had ever seen in his life. He had a very large nose, slightly brass-coloured; his cheeks were very round, and very red, and might have warranted a supposition that he had been blowing a fire for the last eight-and-forty hours; his eyes twinkled merrily through long silky eyelashes, his moustaches curled twice round like a corkscrew on each side of his mouth, and his hair, of a curious mixed pepper-and-salt colour, descended far over his shoulders. He was about four feet six in height, and wore a pointed cap of nearly the same height, decorated with a black feather some three feet long.

Gluck was so perfectly paralysed by the singular appearance of his visitor, that he remained fixed without uttering a word until the old gentleman turned round to look after his fly-away cloak. In so doing he caught sight of Gluck's little yellow head jammed in the window.

"Hollo!" said the little gentleman, "that's not the way to answer the door; I'm wet, let me in."

To do the little gentleman justice, he *was* wet. His feather hung down between his legs like a beaten puppy's tail, dripping like an umbrella; and from the ends of his moustaches the water was running into his waistcoat pockets, and out again like a mill stream.

"I beg pardon, sir," said Gluck, "I'm very sorry, but I really can't."

"Can't what?" said the old gentleman.

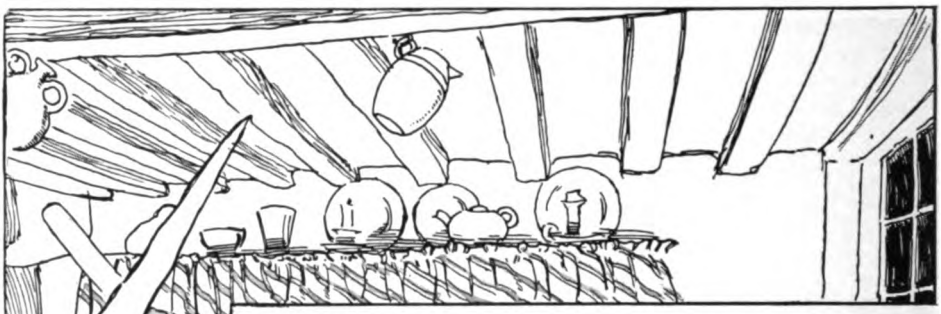
"I can't let you in, sir—I can't indeed; my brothers would beat me to death, sir, if I thought of such a thing. What do you want, sir?"

"Want?" said the old gentleman petulantly. "I want fire and shelter; and there's your great fire there blazing, crackling, and dancing on the walls, with nobody to feel it. Let me in, I say; I only want to warm myself."

Gluck had had his head, by this time, so long out of the window, that he began to feel it was really unpleasantly cold, and when he turned, and saw the beautiful fire rustling and roaring, and

THE OLD GENTLEMAN WENT ON DRIP, DRIP, DRIPPING

The old gentleman went on drip, drip, dripping among the cinders, and his cloak ran like a gutter. "Mayn't I take your cloak?" said Gluck. "No, I'm all right, thank you," said the old gentleman rather gruffly.



throwing long, bright tongues up the chimney, as if it were licking its chops at the savoury smell of the leg of mutton, his heart melted within him that it should be burning away for nothing.

"He does look very wet," said little Gluck; "I'll just let him in for a quarter of an hour."

Round he went to the door, and opened it; and as the little gentleman walked in, there came a gust of wind through the house that made the old chimneys totter.

"That's a good boy," said the little gentleman. "Never mind your brothers. I'll talk to them."

"Pray, sir, don't do any such thing," said Gluck. "I can't let you stay till they come; they'd be the death of me."

"Dear me," said the old gentleman, "I'm very sorry to hear that. How long may I stay?"

"Only till the mutton's done, sir," replied Gluck, "and it's very brown."

Then the old gentleman walked into the kitchen, and sat himself down on the hob, with the top of his cap accommodated up the chimney, for it was a great deal too high for the roof.

"You'll soon dry there, sir," said Gluck, and sat down again to turn the mutton. But the old gentleman did not dry there, but went on drip, drip, dripping among the cinders, and the fire fizzed, and spluttered, and began to look very black and uncomfortable: never was such a cloak; every fold in it ran like a gutter.

"I beg your pardon, sir," said Gluck at length, after watching the water spreading in long, quicksilver-like streams over the floor for a quarter of an hour; "mayn't I take your cloak?"

"No, thank you," said the old gentleman.

"Your cap, sir?"

"No, I am all right, thank you," said the old gentleman rather gruffly.

"But, sir, I'm very sorry," said Gluck hesitatingly; "but really, sir, you're putting the fire out."

"It'll take longer to do the mutton, then," replied his visitor drily.

Gluck was very much puzzled by the behaviour of his guest; it was such a strange mixture of coolness and humility. He turned away at the string meditatively for another five minutes.

"That mutton looks very nice," said the old gentleman at length. "Can't you give me a little bit?"

"Impossible, sir," said Gluck.

"I'm very hungry," continued the old gentleman. "I've had nothing to eat yesterday, nor to-day. They surely couldn't miss a bit from the knuckle."

He spoke in so very melancholy a tone that it quite melted Gluck's heart. "They promised me one slice to-day, sir," said he; "I can give you that, but not a bit more."

"That's a good boy," said the old gentleman again.

Then Gluck warmed a plate, and sharpened a knife.

"I don't care if I do get beaten for it," thought he. Just as he had cut a large slice out of the mutton, there came a tremendous rap at the door. The old gentleman jumped off the hob, as if it had suddenly become inconveniently warm. Gluck fitted the slice into the mutton again, with desperate efforts at exactitude, and ran to open the door.

"What did you keep us waiting in the rain for?" said Schwartz, as he walked in, throwing his umbrella in Gluck's face. "Ay! what for, indeed, you little vagabond?" said Hans, giving Gluck a box on the ear.

"Bless my soul!" said Schwartz, when he opened the door.

"Amen," said the little gentleman, who had taken his cap off, and was standing in the middle of the kitchen, bowing with the utmost possible velocity.

"Who's that?" said Schwartz, catching up a rolling-pin, and turning to Gluck with a fierce frown.

"I don't know, indeed, brother," said Gluck, in great terror.

"How did he get in?" roared Schwartz.

"My dear brother," said Gluck deprecatingly, "he was so *very* wet!"

The rolling-pin was descending on Gluck's head; but, at the instant, the old gentleman interposed his conical cap, on which it crashed with a shock that shook the water out of it all over the room. What was very odd, the rolling-pin no sooner touched the cap than it flew out of Schwartz's hand, spinning like a straw in a high wind, and fell into the corner at the further end of the room.

"Who are you, sir?" demanded Schwartz, turning upon him.

"What's your business?" snarled Hans.

"I'm a poor old man, sir," the little gentleman began very modestly, "and I saw your fire through the window, and begged shelter for a quarter of an hour."

"Have the goodness to walk out again, then," said Schwartz. "We've quite enough water in our kitchen, without making it a drying-house."

"It is a cold day to turn an old man out in. Look at my grey hairs."

"Ay!" said Hans, "there are enough of them to keep you warm. Walk!"

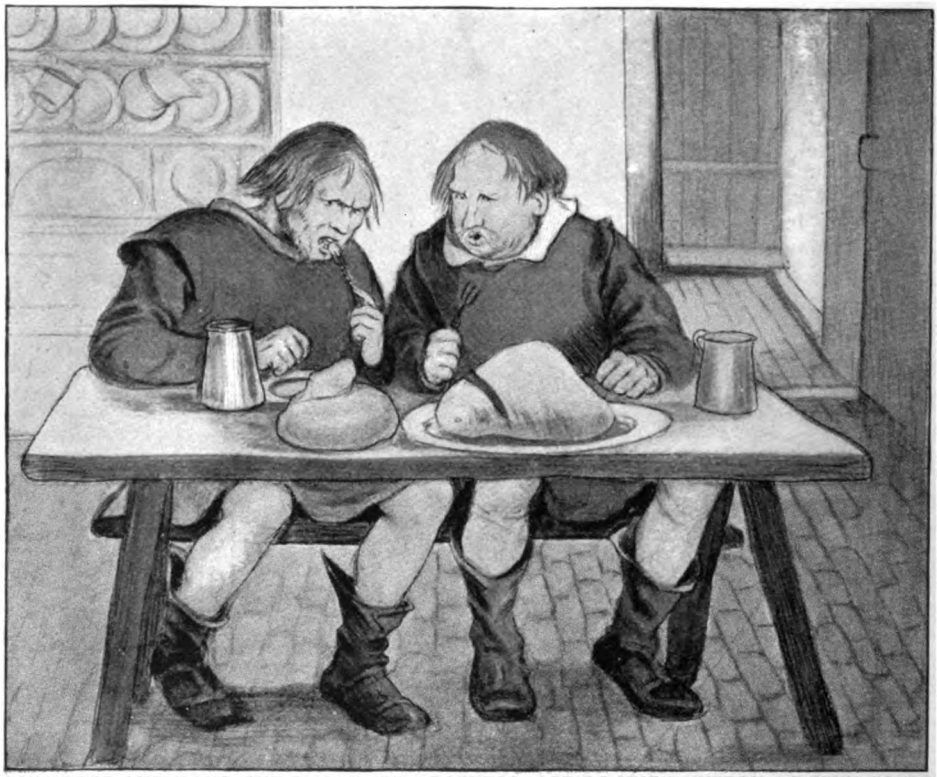
"I'm very hungry, sir; couldn't you spare me a bit of bread before I go?"

"Bread, indeed!" said Schwartz. "Do you suppose we've nothing to do with our bread, but to give it to such red-nosed fellows as you?"

"Why don't you sell your feather?" said Hans sneeringly. "Out with you!"

"A little bit," said the old gentleman.

"Be off!" said Schwartz.



SCHWARTZ AND HANS, THE TWO ELDER BROTHERS, ATE AS MUCH MUTTON AS THEY COULD

"Pray, gentlemen."

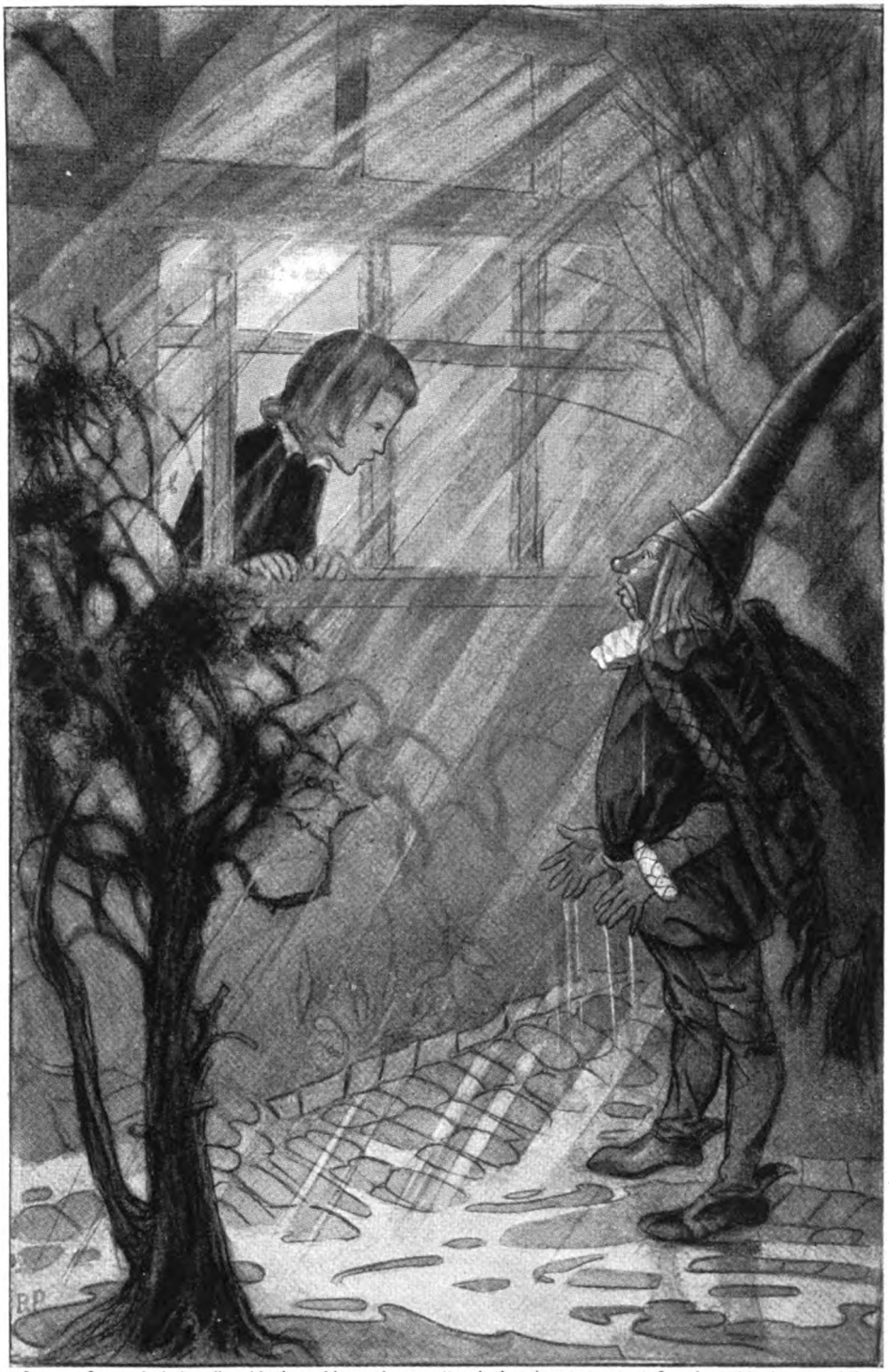
"Off, and be hanged!" cried Hans, seizing him by the collar. But he had no sooner touched the old gentleman's collar than away he went after the rolling-pin, till he fell into the corner on the top of it. Then Schwartz was very angry and ran at the old gentleman to turn him out; but he also had hardly touched him, when away he went after Hans and the rolling-pin, and hit his head against the wall as he tumbled into the corner. And so there they lay, all three. Then the old gentleman spun himself round, and replied with perfect coolness: "Gentlemen, I wish you a very good morning. At twelve o'clock to-night I'll call again; after such a refusal of hospitality as I have just experienced, you will not be surprised if that visit is the last I ever pay you."

"If ever I catch you here again," muttered Schwartz, coming, half frightened, out of the corner——but, before he could finish his sentence, the old gentleman had shut the house door behind him with a great bang; and there drove past the window, at the same instant, a wreath of ragged cloud, that whirled and rolled away down the valley in all manner of shapes, melting away at last in a gush of rain.

"A very pretty business, indeed, Mr. Gluck!" said Schwartz. "Dish the mutton, sir. If ever I catch you at such a trick again—— Bless me, why, the mutton's been cut!"

"You promised me one slice, brother, you know," said Gluck.

THE LITTLE GENTLEMAN AT THE WINDOW



"I want fire and shelter," said the old gentleman, "and there's your great fire there blazing, crackling, and dancing on the walls, with nobody to feel it. Let me in, I say; I only want to warm myself."

"Oh, and you were cutting it hot, I suppose, and going to catch all the gravy. It'll be long before I promise you it again. Leave the room, sir."

Gluck left the room melancholy enough. The brothers ate as much mutton as they could, locked the rest in the cupboard, and proceeded to get very drunk after dinner.

Such a night as it was! Howling wind, and rushing rain, without intermission. The brothers had just sense enough left to put up all the shutters, and double bar the door, before they went to bed. As the clock struck twelve, they were both awakened by a tremendous crash. Their door burst open with a violence that shook the house from top to bottom.

"What's that?" cried Schwartz, starting up.

"Only I," said the little gentleman.

The brothers stared into the darkness. The room was full of water, and they could see in the midst of it an enormous foam globe, spinning round, and bobbing up and down like a cork, on which reclined the little old gentleman, cap and all. There was plenty of room for it now, for the roof was off.

"Sorry to incommode you," said their visitor ironically. "I'm afraid your beds are dampish. Perhaps you had better go to your brother's room. I've left the ceiling on there."

They required no second admonition, but rushed into Gluck's room, wet through, and in an agony of terror.

"You'll find my card on the kitchen table," the old gentleman called after them. "Remember, the last visit."

"Pray Heaven it may be!" said Schwartz, shuddering. And the foam globe disappeared.

Dawn came at last, and the two brothers looked out of Gluck's little window in the morning. The Treasure Valley was one mass of ruin and desolation. The flood had swept away trees, crops and cattle, and left in their stead a waste of red sand and grey mud. The two brothers crept, shivering and horror-struck, into the kitchen. The water had gutted the whole first floor—corn, money, almost every movable thing had been swept away, and there was left only a small white card on the kitchen table. On it, in large, breezy, long-legged letters, were engraved the words:

THE NEXT PART OF THIS STORY BEGINS ON PAGE 1526

WHAT THIS STORY TELLS US

WE have read the story of the red cells that carry the air from the lungs to every part of the body, and in these pages we learn about cells more wonderful still, more intensely alive and active, which protect us from our enemies—about the scavenger cells, which clear away dirt and waste matter, and the soldier cells, which fight and kill dangerous microbes whenever and wherever they enter the body. It is in these white cells that there lies what was long ago called the "healing power of Nature." Also we learn here about the gases in the blood, and especially about the carbonic acid gas, which is carried by a special salt from every part of the body to the lungs, and then got rid of. In five minutes, if this were not being done, we should die—poisoned by this gas which we must make, and must get rid of, if we are to live. We learn here also about the food in the blood, and the things in it that carry messages, and others that help the white soldier cells to kill the evil microbes.

THE WHITE CELLS OF THE BLOOD

CONTINUED FROM 1386

Now we must pass to the other kind of cells in the blood — the white cells, about which a little has already been said, since many of them really look very like the pond amœba. These are very few in the blood compared with the red cells. A volume of blood equal to two pins' heads, which should contain some four or five millions of the red cells, should contain only about eight thousand of the white cells—that is, when we are well. In many kinds of illness, however, the number of white cells greatly increases; perhaps five or even ten times. Doctors used to think that this was one of the bad things about the illness, but now we know better. It happens because the white cells are specially useful in illness, and is one of the ways in which the healing power of Nature shows itself.

These white cells vary a good deal, unlike the red cells, which are all of the same pattern. They vary in size, in the way they stain with various colouring matters, and so on. Probably all these different kinds represent different stages in the history of their lives. They have no elastic coat, but can and do change their shape readily.

For many years it was a great puzzle to find out any use for these white cells. Then many curious things began to be noticed. White cells were seen with microbes inside them, and at first it was thought that the microbes had invaded the cell and were killing it; but then white cells were found with little specks of coal-dust in them, which the cells must have picked up for themselves. Then we learned how to keep a drop of blood warm under the microscope, so that we could watch the white cells even for hours at a time, and it was found that those which had microbes in them did not die, but after a time the microbes disappeared, and the white cells went on living.

Then we found that we could actually see the white cells picking up microbes or specks of any foreign matter in the blood, and dealing with them just as the amœba deals with anything that it is feeding on. Nor was this all. By studying the blood-vessels of a living tissue under the microscope, we discovered that the white cells have a way of passing through the walls of the blood-vessels, and wandering about in the tissues of the body generally. This is now usually called their emigration.

Now, suppose there has been a little damage done to your finger; perhaps some dirt and some microbes have got into the wound. We find that

the white cells of the blood make their way through the blood-vessels in the neighbourhood of the damage, not in ones, but in thousands. They can be watched doing so, and we find that it may take perhaps as long as half an hour for a single cell to make its way through. There they gather round the place of damage.

THE LITTLE WHITE SOLDIERS THAT DIE TO SAVE YOUR LIFE

Meanwhile, if it is at all a serious damage, in some wonderful way the whole body seems to be told of the fact, and the various organs which make these white blood-cells are urged into unusual activity. If, now, we count the white cells in a drop of blood anywhere, taken from any part, we may find them greatly increased. The cells which emigrate from the place where the damage is attack the microbes, and in nearly every case are victorious, killing them and eating them up.

It is by this means that we recover from such a damage. If you have ever had a poisoned finger, it was the white cells of your blood that enabled you to recover; it was they who killed the attacking microbes which had got into your finger. They die in tens of thousands when they do this, and the creamy sort of stuff which we sometimes call "matter," which the doctor sometimes has to let out of a poisoned finger, is largely made up of the dead bodies of these little soldiers which have died to save the body they belong to.

ONE OF THE MOST WONDERFUL STORIES IN THE WHOLE BOOK OF LIFE

The white cells, then, which were so long a puzzle, now provide us with one of the most wonderful stories that can be read in the whole book of life. They are the defensive army of the body against living enemies from outside, as also against foreign particles that are not alive. They have often been described as the scavengers of the body, or as its police. So far as we can judge at present, during a considerable part of our lives they have very little to do, but they always have to be in readiness, like soldiers or police or the fire-brigade, because at any moment something may happen which needs their attention. It seems quite clear that our recovery from all infectious diseases is due to these little white cells. When we get better from inflammation of the lungs, or scarlet fever, or measles, whooping-cough, chicken-pox, and so on, it is not the doctor who has made us well, but it is ourselves, acting mainly through our white blood-cells. What the doctor can do and does is simply to put us in the best possible conditions so that we may be able to cure ourselves.

Long ages ago great men wrote and spoke about the healing power of Nature. The Latin phrase for that is worth mentioning, for it has to be learned some time. It is *vis medicatrix naturæ*. *Vis* means power or force, and *medicatrix* means healing. Every day that we study the body in health or in disease, whether the body of man, or the bodies of the lower animals, or the bodies of plants, we learn more and more to respect and understand this healing power of Nature. If we come to think of it, life has always, since it began upon the earth, had enemies to fight against—changes of temperature, blows by the wind and blows of water, accidents of a thousand kinds, the attacks of other kinds of life, things that were poisonous to life, and so on.

THE GREAT WONDER OF THE WAY IN WHICH NATURE HEALS US

Therefore, from the very first, it has been necessary for living creatures to learn how to recover from injury. If every injury were to leave damage that remained, life could not have gone on. Throughout the ages this power of recovery must have been increasing, and perhaps, on the whole, it is greater in man than in any other creature.

We know the existence of disease and death and accident, and we see the evidence of much injury that cannot be repaired around us; but we ought not to forget how much injury, how many accidents, how many risks of poisoning, are made right by this healing power of Nature. When that great phrase was invented, men did not in the least understand how this healing power worked. They had scarcely examined the body at all; they merely saw that living creatures in general had something within them that could often protect and save them.

But now we can point to the white cells of the blood, and can say that here, in visible form, is the healing power of Nature about which our ancestors spoke. We can take a drop of blood from a patient who is recovering from an infectious disease, and can see the white cells eating up the microbes in that drop of blood—can practically see what is happening in his blood at that moment. This is far from being the only means by which the body protects itself, but it is perhaps the most wonderful.

THE WONDERFUL THINGS THAT HAPPEN WHEN YOU HURT YOUR FINGER

Another thing which the story of these white cells teaches us is the wonderful unity of the body. The least little injury—a little dirt or the tearing of a finger-nail—and the whole body seems to know at once. The spleen, which is far away inside the body, tiny little glands lying under the skin of the neck and in the armpit—all these are made aware, so to say, probably by means of chemical messengers sent them from the injured part, and at once they begin to double or treble their activities and produce millions of white cells—all because the tip of a finger is in trouble.

This is one of the great services of the blood, in addition to all the other services it performs. It not only carries oxygen and food, and the soldiers—or should we call them the sailors?—of the body, but it is a great carrier of messages and messengers. Nothing happens in any part of the body without producing chemical changes, and the compounds which are the results of these changes get into the blood, and are carried by the blood-stream; then, whenever they come to another part of the body which has some business with them, the appropriate result happens. We may hope that some day nations may be as beautifully and unselfishly ordered as the human body is.

HOW ALCOHOL DESTROYS THE POWER OF THE LITTLE WHITE SOLDIERS

We have lately learned that the white cells are much affected by many things in the course of our lives besides the occurrence of damage or danger. Large numbers of them enter the blood when we digest a meal. We do not yet know why. But we have learned that a great many drugs, many of which were supposed to be useful, paralyse the white cells so that they cannot do their work. This is one of the chief reasons why most doctors are nowadays giving much less medicine than they used to give. They are learning to trust more to the healing power of the body itself, and they will not take the responsibility of giving things which simply interfere with that healing power, and perhaps do nothing else. One of the things which has the most marked action in this respect is alcohol. In the presence of only tiny quantities of this substance, the white cells cease to move, and will take no notice of microbes which, if the alcohol were not present, they would eat up at once. This explains why both men and animals who have been given alcohol do not recover from infectious diseases so often as those who have had no alcohol.

Besides the red cells and the white cells, there are other tiny little bodies in the blood, though we should almost think that there could be no room for them. They are very tiny, round, and transparent, and are called the blood-plates; they are much more numerous than the white cells, but much less numerous than the red. At present we do not know their use.

THE GASES THAT HELP TO MAKE UP OUR BLOOD

That is all we need say about the solid part of the blood. We still have the liquid part and the gaseous part to study. There is much less to say about the gaseous part, but we shall take that first because it goes with what we have said about the duties of the red cells.

The most important gas in the blood is, of course, oxygen. Of this very little is found in the blood in the veins which is going to the lungs, but much in the blood that is coming from the lungs. Nearly the whole of it occurs, however, not as a gas, in which state it would take up far too much room, but combined with Hb to form HbO_2, as we have seen. A very little oxygen is simply dissolved in the fluid part of the blood.

A good deal of nitrogen is always dissolved in the fluid part of the blood, to which it has gained entry from the air through the lungs. It serves no purpose, and does nothing of any kind. Without compounds of nitrogen in our food we should die, but it is only certain

kinds of humble plants that can take simple nitrogen and combine it. The whole animal world, including ourselves, is dependent for its nitrogen compounds upon them.

When we breathe chloroform or laughing-gas in order to avoid pain, these gases are, of course, to be found in the blood. Also, when we breathe impure air, the various gases occurring in it are to be found in the blood.

THE GAS THAT IS ALWAYS BEING MADE IN OUR BODIES

These, however, are exceptions. There is one other most important gas which is always found in the blood, and corresponds, so to say, with the oxygen about which we have been talking. This gas is carbonic acid, the molecule of which consists of one atom of carbon and two of oxygen, so that we write for it CO_2. This is a constant and continuous product of our bodies, just as it is the product of the burning of a fire.

If a fire does not get rid of its carbonic acid, it will be choked, and the same is true of ourselves. There are thus two great differences, and not one, between the blood that runs to the fingers and the blood that runs back from them. The blood that runs to the fingers is rich in oxygen, as we have seen, but contains scarcely any carbonic acid; the blood that comes back in the veins is poor in oxygen, but rich in carbonic acid, which it is carrying to the lungs, where we get rid of quantities of it every time we breathe out. There is such a quantity of this carbonic acid gas to be carried back from the tissues to the lungs that it could not be packed away in the blood in its gaseous form, and so, just as the oxygen has to be combined with something and packed away in HbO_2, which is really a solid, so the carbonic acid has to be combined with something.

WHY NONE OF US CAN LIVE FOR A MOMENT WITHOUT SALT

It seems, however, that neither the red blood-cells, nor the white, nor the blood-plates, have anything to do with this. It is mainly done by one of the precious salts which are always to be found dissolved in the fluid part of the blood. There is a large number of these salts, all of which are necessary to our lives, and therefore necessary parts of our food. Most, if not all of them, are similarly found in the blood of all creatures that have blood and in the body fluid of those creatures which have no blood. The particular salt which carries the carbonic acid within itself, from the tissues to the lungs—or, at any rate, carries much the greater part of it—is called *sodium carbonate*, and though we may not have heard the name before, yet we have all heard of washing soda, and that is really the same thing.

Now, sodium carbonate itself is a compound of the metal sodium and carbonic acid, but there is another salt which is very nearly the same, only it contains two doses, so to speak, of carbonic acid instead of one in each of its molecules. This salt is called sodium bi-carbonate, *bi* simply meaning two. Now, we also know sodium bi-carbonate quite well, for it is none other than what we call baking soda. Outside the body, when we study these two salts, we can observe that, under certain conditions, the simple carbonate will take up carbonic acid and become bi-carbonate; and in other conditions the bi-carbonate will give up half its carbonic acid, and become the simple carbonate.

HOW THE BODY GETS RID OF THE POISONOUS GAS THAT IT MAKES

These two processes are going on ceaselessly in our blood, and are necessary for our lives; but it seems that they go on much more easily and quickly in our blood than outside, partly because of the warmth of the body, and probably also because of some power the body has of making chemical changes within itself quick and easy, though they may be slow and difficult outside.

And now we can picture what happens when pure blood goes to nourish any part of the body. Dissolved in the fluid part of it is a quantity of sodium carbonate. Now, the part of the body to which it goes is living, which means burning, and has made a lot of carbonic acid which it must get rid of. This passes into the blood and combines with the sodium carbonate which it finds there, so as to form sodium bi-carbonate, and that is carried back in the veins, by which at last it reaches the lungs—it probably gets there even from the feet in about two minutes—and there the sodium bi-carbonate is broken up again and loses the extra dose of carbonic acid which it got from the body, and we breathe that out, and so are rid of it.

This, we see, leaves sodium carbonate again in the blood, ready to go to the tissues again, and take up another dose of carbonic acid just as it did before. And so it goes round and round again, like the hæmoglobin and the oxygen. The greatest difference is really that in the one case something which they want is being taken to the tissues, whilst in the other case something they must be rid of is being taken away from them.

THE REAL MACHINERY THAT WORKS WHEN WE BREATHE

But now we are able to look at these two things as the two balanced halves of one process, and that process is breathing, the first necessity of all life. Everything that we call breathing—moving our chest and taking in air, and so on—is really only the beginning of one half of it—that is to say, getting the oxygen; and the end of the other half of it—that is to say, getting rid of the carbonic acid. The real breathing is what the living cells of the body do themselves, aided by the ever-moving blood, which brings them the oxygen and takes away the carbonic acid.

We know that when a flame burns in a good draught it burns quickly and brightly. Now, what does the draught do? It simply blows oxygen to the fuel, and then blows away the carbonic acid that is produced when it burns. If we come to think of it, that is exactly the same as what happens while the blood moves in our body; and just as a fire burns brightest in a good draught, so our bodies burn best and in the most healthy way when the blood moves quickly through them. Sometimes the blood moves too slowly, and becomes almost stagnant in one part or another of the body. This simply means that that part cannot breathe, and so it falls ill. And if the blood be prevented altogether from going to any part of the body, in a very short time it will die. Perhaps we are beginning to learn how wonderful the blood is.

NO MAN QUITE KNOWS THE BUSINESS OF THE SALT IN OUR BLOOD

Now, there still remains the fluid part of the blood to study, and this is equally necessary for our lives. We have already learned one thing about it—that it contains various salts dissolved in it. They all are necessary, but if we had to call any one of them more important than the others, it would be the sodium carbonate, or bicarbonate, about which we have been speaking. This, however, is not the most abundant of the salts in blood.

Common salt, or sodium chloride, which we all know so well, is the most abundant salt in the blood, and gives blood its salt taste, just as it gives tears their salt taste; the tears, of course, have got their salt from the blood. We are far from understanding yet what the sodium chloride in the blood is really necessary for. Certainly we know some useful things it does, but probably there is a great deal more that we do not yet know. It helps to keep certain parts of the blood and the body fluid, for some of the things necessary to the blood and the body will turn stiff and solid if the salt is taken from them. Also, the common salt in the blood is of great importance in the digestion of food, for as it passes through the walls of the stomach certain wonderful little cells that line the stomach act upon this common salt, or sodium chloride, and produce from it an acid, called *hydrochloric acid*, which they pour into the stomach whenever we take any food, and which is very important in digestion.

HOW THE BLOOD HELPS THE BODY TO GET RID OF WHAT IT DOES NOT WANT

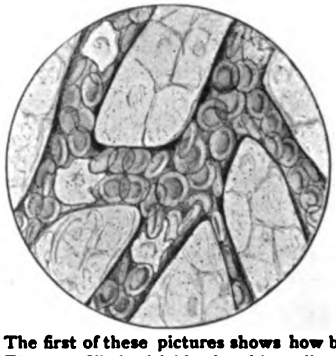
But the sodium chloride of the blood is probably more important than we understand yet. As for the other salts, we scarcely know at all why they should be necessary, though they certainly are.

The rest of the fluid part of the blood is the most astonishing mixture of wonderful things in the whole world. Only quite lately have we begun to learn how wonderful it is. Every speck of food that is to be of any use to us must be carried by the blood; and this alone means that it contains a large number of compounds of very different kinds—various kinds of fat, sugar, and especially the precious food stuffs which we call proteids.

Then, again, all the substances which are produced by the life of the tissues and have to be got rid of are poured into and contained in the fluid part of the blood. We must not imagine that carbonic acid is the only

product of the life of the tissues, though it is the most important one. There are many others, probably amounting to scores, all of which have to be got rid of by the various organs which, besides the lungs, exist for this purpose, especially the kidneys and the skin.

Nor is this all. As we have learned during the present century, the blood also contains, in addition to the white cells, various fluid substances which are poisonous to microbes. This is one of the reasons why we are ever healthy at all—why, though we frequently breathe microbes, though we take millions of them in our food, and though many of them would be injurious to us if they could, we lead what would have long ago been called a "charmed life." These protective substances are partly produced by the white cells of the blood, and are partly given to it by the tissues of the body. They exist in the blood of the lower animals as they do in our own. Then the blood contains a large number of special compounds made by the body itself for its own use. Those parts of the body which produce special chemical substances are called glands. Many glands have little tubes running from them, into which they send what they produce; for instance, the glands that produce the saliva that comes into our mouths when we eat. But several other glands have no tubes of this kind at all. They exist in order to make contributions to the blood for the good of the whole body, and as the blood passes through them it simply takes up these contributions, and carries them where they will be useful. Then there are also, as we know, substances in the blood which simply act as messengers between one part of the body and another, and are carried about by it for that purpose.



The first of these pictures shows how blood-vessels look through a microscope. They are filled with blood and its cells, most of them red cells, round and regular, but some of them white cells, large and jelly-like. In the second picture we see some of the soldier-cells—the large white cells of the blood—making a stand against a number of microbes, shown dark. One cell has eaten one or two microbes.

Perhaps we shall begin to think, then, that a drop of blood is, on the whole, the most wonderful thing in the world. I do not think it would be possible to get anything so complicated in so little space as a drop of blood. But though the blood serves the brain, as it does the rest of the body, and though in a very few seconds the brain stops acting if it does not get fresh blood, the brain is really more wonderful still, and a speck of it containing the nerve-cells is a thousand times further beyond our understanding even than the blood is, for it is those nerve-cells with which we think, and that is the mystery of mysteries.

We must now learn about the heart, and the way in which it drives the blood. This great discovery was made by an Englishman, and it is fair to say that all real knowledge of the working of the body dates from that time. This is one of those great discoveries that open the door to whole realms of Nature. Some discoveries are like this: they explain any number of things that could not be explained before. They show the way to still further knowledge, and give us the means of getting there. The discovery of the living cell, the discovery of gravitation, the discovery of the earth's motion round the sun, and the discovery of the circulation of the blood—all these belong to this class of mighty keys to Nature's plan; and when we go on to learn many new things about the body, and about life in general, we have to remember that though we now see further even than William Harvey, about whom we must learn in the next part, it is because we are, as it were, standing on his shoulders.

The next part of this is on page 1579.

WHAT OUR LESSONS TEACH US

THE Reading lesson in these pages teaches us something new, for in it we learn for the first time something about Grammar. Our Writing lesson gives us three new letters which come above and below the lines. If we are learning figures we can turn to the Arithmetic lesson and learn the names of the numbers from 20 to 99. The fairies have more surprises for us in our Music lesson, and for our Drawing this time we are going to draw and paint a spray of leaves. And last, in our Picture-Stories in French, we read how the party arrived in Paris.

CONTINUED FROM PAGE 1215

READING

A FIRST LESSON IN GRAMMAR

Now we have got on far enough to be able to do a little English Grammar. We shall find that it will help us to learn to read more quickly. And there is no need to be frightened by the word grammar, because grammar is really very interesting.

If you are a POY, and if you have a sister, you will not call her a BOY, but a GIRL. If you have a schoolmaster, you will call him a clever MAN; but if you are taught by a mistress, you call her a clever WO-MAN. There are many pairs, or couples, of words like this. One is used of people who are males—that is, men and boys—and the other is used of females—that is, women and girls. Here are some of these pairs of words:

BOY	GIRL
MAN	WO-MAN
KING	QUEEN
MAS-TER	MIS-TRESS
LORD	LA-DY

You can go on thinking of plenty more of these if you only try. Ask yourself what relations you have, and you will be able to think of a large number of words like these:

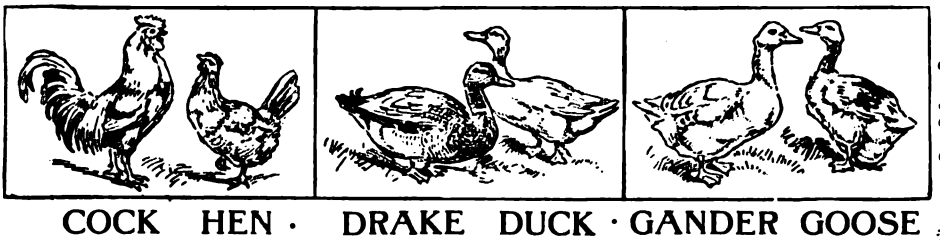
FA-THER	MO-THER
BRO-THER	SIS-TER
UN-CLE	AUNT

Your father calls you his SON if you are a boy, or his DAUGH-TER if you are a girl; and your mother and father can speak of each other as HUS-BAND and WIFE. And when they were being married people spoke of them as BRIDE-GROOM and BRIDE.

Bridegroom and Bride

You will have noticed that the words in the first column always belong to men, or males, and the words in the second column always belong to women, or females.

The same thing is found in speaking of animals. If you go into a farmyard you will see lots of fowls and ducks and geese, and hear them, too, for they do make a noise. When you want to speak of *Mister* Goose, you call him GAN-DER; and if you are anxious to get to know Mrs. Duck's husband, you ask for DRAKE. So we get some more pairs of words to learn:



COCK HEN · DRAKE DUCK · GANDER GOOSE

Don't you remember that in your nursery rhyme you used to say:

"GOOSEY GOOSEY GANDER,
whither will you wander?
Upstairs and downstairs, and in my LADY'S chamber."

All the words that mean males are said to be of masculine gender, and all the words that mean females are feminine. Try to remember these two difficult words.

Now, after all this hard work, here is an easy little rhyme to end up with:

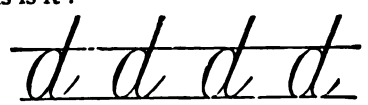
When BABY wants to use her teeth
She bites her FATHER'S LOCK-ET,
And you should see how quick she is
To find it in his POCK-ET.

WRITING

LETTERS ABOVE AND BELOW THE LINES

It took some time for Tom and Nora to write a good l, b, t, h, and k, because they all have loops above the line; but when they were able to write good ones they came to their mother to find out how to make three new letters: d, g, and q.

"D," said their mother, when Tom and Nora had ruled their lines, "will remind you very much of an old friend. This is it:



Directly she had written one d, Nora exclaimed:

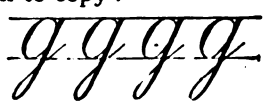
"It is like a grown tall, and it does look easy to make."

"See," said her mother, "I start making d like the first part of a, but when I bring the pencil round to the upper line I do not take it down again at once, as we do in writing a, but carry it right up above the line a little further than the top of the t, but not quite so far as the loops of l, b, h, and k. Then I bring the pen down again more heavily over the up-stroke and end in a pot-hanger, just like t, l, and h. If we remember, as Nora says, that d is a grown tall, a with a top to it, there is really nothing new to learn about it.

Tom was busy thinking about d, and when he started copying the d's his mother had made he whispered to himself, "a, d, a, d."

Now, Nora was learning to spell little words, and she knew that a d spelt ad at the beginning of words, so she said that would also help Tom and herself to remember d was like a with a top added.

Nora and Tom soon learned to write good d's, and then their mother said: "The next letter, g, has something new about it." She then wrote this for them to copy:



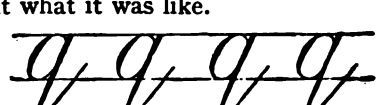
"The first part of it is like a; but the last part—the tail—what is that like?"

Tom and Nora watched their mother as she made the g, and then Tom said the tail had a loop like l, but the loop was down below the line, not above it.

His mother said that was quite right, and that the loops of all letters below the line were just the same lengths as the loops of l, b, h, and k above it. Loops, she told them, must be made the proper length, and the pencil cross over just below the line. Though at first Tom found it by no means easy to make the loops of g all the same length, he found, after a time, that the more carefully he looked at his mother's g before beginning to make one, and saw how long to make the looped tail, the less likely he was to make a bad letter.

"That's the secret of it, Tom," she said. "Look carefully; be sure you are right; then go ahead."

One other letter the brother and sister learned to write that day, and as their mother made it for them to copy they watched her to see if they could find out what it was like.



"It has a tail," said Tom.

"But it is not a loop," exclaimed Nora. "What a funny letter! It seems

in a hurry to end itself, and has no time to make a proper loop like g. What is it called, mother ?"

"It is a q," she replied. "Its tail is just as long as g's ; but you see when my pencil comes to the bottom of the down-stroke of the tail it turns up to the line again on the right. No other letter does that. How can we remember it ? This will help us : q begins queen. It begins the word queer, too, so shall we call it queer q ?"

Nora said that she thought that would help them to remember q.

THE NAMES OF THE NUMBERS FROM 20 TO 99

By this time we can do without always speaking of a bundle of ten pencils. We will call them "tens" only. And the odd pencils in the right-hand box we will call "ones." To go on, then, from nineteen, which is a number made up of a "ten" and nine "ones." When we put one more to this number, we have ten "ones" in the right-hand box, like this:

1	10

But we now have to tie the ten "ones" into a bundle and make a "ten" of them, which we put into the "bundle" box. Then there will be *two* "tens" in the left-hand box and no "ones" at all in the other box, like this:

2	0

The name of this new number, made up of two "tens," is *twenty*. The figures for it, we have just seen, are 20. The names of the numbers after this are easy to remember, up to the time when we again have ten "ones" in the "one" box. We only have to put the one, two, three, and so on, after the twenty, and we get :

twenty-one	21	twenty-six	26
twenty-two	22	twenty-seven	27
twenty-three	23	twenty-eight	28
twenty-four	24	twenty-nine	29
twenty-five	25		

Another "one" put to twenty-nine gives us ten "ones" in the "one" box, which we can tie into a bundle and put into the "bundle" box. Then we have three "tens" and no "ones," so that the figures which stand for the number are 30.

This number, made up of three "tens," is called *thirty*. In just the same way as before, another "one" added to this makes *thirty-one*, and so on.

thirty-one - - - 31
thirty-two - - - 32
thirty-three - - 33
up to thirty-nine - - - 39

After this comes the number made up of four "tens," which is called *forty* (40)

Then we go on again till we come to the next number after forty-nine (49) ; this will have four "tens" in the "ten" box and ten "ones" in the "one" box, which can be made into five "tens" and no "ones"—50. This number is called *fifty*.

We will now write down the names of the other numbers which are made up of an exact number of "tens," with no "ones" left over. The names of the numbers in between are easy.

The number made of six "tens" is called *sixty* (60).

The number made of seven "tens" is called *seventy* (70).

The number made of eight "tens" is is called *eighty* (80).

The number made of nine "tens" is called *ninety* (90).

So that now we ought to know the names of all the numbers from *one* to *ninety-nine*, and the figures which stand for them.

Let us try a few of them.

What number do the figures 57 stand for ? Fifty-seven ; because the right-hand figure means 7 "ones," and the figure to the left of the "ones" stands for "tens," so that we have 5 "tens," and the number made up of 5 "tens" and 7 "ones" is what we call fifty-seven.

What are the figures which stand for eighty-two ?

Eighty-two means 8 "tens" and 2 "ones," and, because we always put the "ones" figure at the right hand, the figures which stand for eighty-two will be 82.

What are the figures which stand for fifty? 50.

Why do we have to write the 0? Because we want the figures to stand for 5 *tens* and *no* "ones," so we must put the 5 for the "tens" and the 0 for the "ones." If we did not put down the 0, but only wrote 5, this would not stand for fifty at all. It would simply mean five "ones," or what we call "five."

Here is an exercise which you can do by yourselves. Say to yourself, or write down, the names of these numbers: 73, 49, 88, 60, 92, 17, 54, 31, 23, 40.

What are the figures which stand for

Twenty-one	Eighty
Forty-seven	Seventy-six
Ninety-eight	Thirty-three
Fifty-five	Sixty-nine
Eighteen	Fifteen

You will have learned all these names before we come to our next lesson.

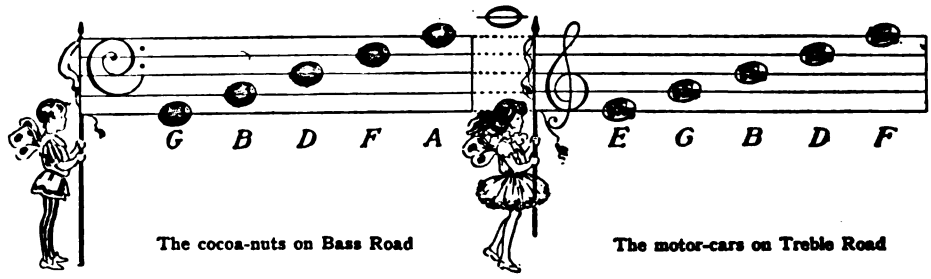
MUSIC

THE FAIRIES IN THE TULIPS

WHEN once we begin to let fairies talk to us, it is quite wonderful how much we learn from them, and how many new things they will show us. We have let them introduce us to the Treble Road and the Bass Road, and already we have seen a fairy procession in wee motor-cars, and a fairy meeting when the fairies arrived on the scene in cocoa-nuts. The motor-cars are still waiting in the Treble Road, and the cocoa-nuts are still to be seen in the Bass Road. But even now there are more fairy wonders in store for us.

One morning Treble Clef was heard the other day that they shut themselves very closely in their little cars to protect themselves against the weather. And so, when the cocoa-nuts arrived on the scene, we heard the fairies' voices, but still we could not see them. Sometimes they can sing to us out of several of their houses at once; sometimes they will leave one of their houses and sing to us from the door of another; but we always have to be very wide awake to understand what is really going on.

While Treble Clef and Bass Clef were having their little talk, the sun whispered the fairies' new secret to Treble Clef



The cocoa-nuts on Bass Road

The motor-cars on Treble Road

telling Bass Clef that her road was prettier than it had ever been, for, curiously enough, in the night beautiful flowers had grown in the spaces between the motor-lines, flowers of different colours, very much like the shape of tulips.

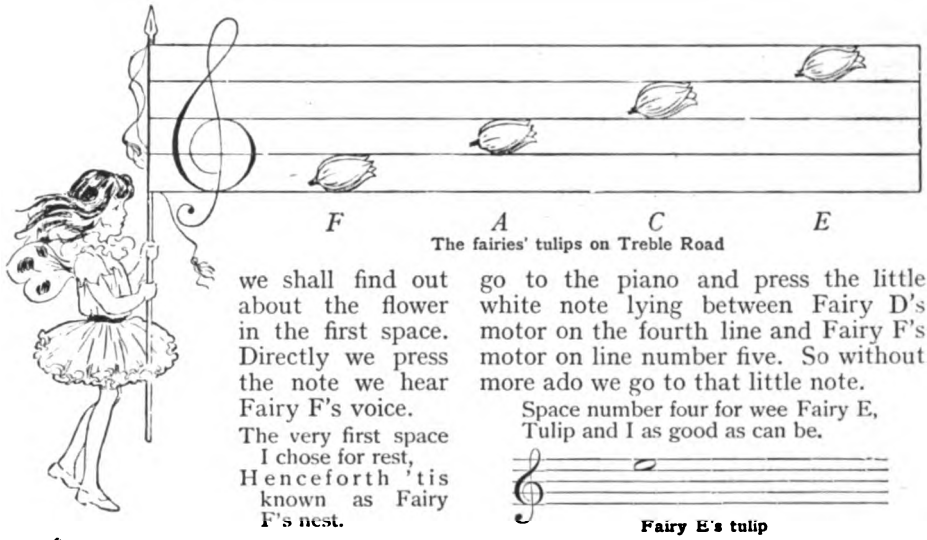
"Indeed, that is strange," answered Bass Clef, "for when I opened my eyes at break of day I looked down my road, and saw shells of varied hue lying between the cocoa-nuts in which the fairies arrived yesterday."

Now, you know, fairies can do all sorts of strange things, and they are very fond of big surprises. We heard and the wind told all she knew to Bass Clef.

The fairies thought Treble Clef had managed their procession so nicely that they would give her a treat, so they decided among themselves that when she woke in the morning she should see beautiful tulips growing in the spaces between the motor-lines, and Fairy F, Fairy A, Fairy C, and Fairy E said they would go and stand inside the tulips, and sing when the right *note* was pressed on the piano.

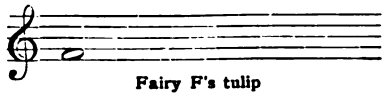
Do you notice that the little white door is called *a note?* Because the fairies think we are getting to under-

stand them so well that we can begin to speak their language, and they call these little white doors, and the black ones, too, *notes*. We remember that Fairy E's motor-car stopped on the first line, and directly she arrived there we had to go to the piano and press the next white note but one on the right of Fairy C's middle home. Treble Clef now says that if we go to the little white note on the right side of Fairy E we shall find out about the flower in the first space. Directly we press the note we hear Fairy F's voice.



The fairies' tulips on Treble Road

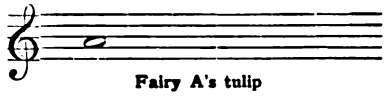
The very first space
I chose for rest,
Henceforth 'tis
known as Fairy
F's nest.


Fairy F's tulip

"What about the second flower?" we ask our friend Treble Clef.

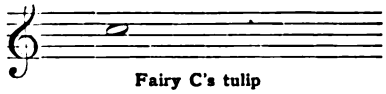
As usual, she sends us to the piano, saying, "You remember which little white note told you about Fairy G's motor on the second line; well, the very next white note on the right of Fairy G is the one to press if you would find out about the flower in the second space." We find the note quite easily, as it lies between the Fairy G and Fairy B. Press it down gently.

"Who's in the second space?" you say,
And a little voice answers, "Fairy A."


Fairy A's tulip

Now we come to the third flower. If we would understand this flower we must go to the white note on the piano which lies between Fairy B's motor on the third line and Fairy D's car on the fourth line. Let us press it down gently and listen.

Rat-a-tat-tat! at space number three;
"Who is at home?" "It is Fairy C."


Fairy C's tulip

Still there is a fourth flower, and again we turn to Treble Clef. She tells us we can find out all about it if we go to the piano and press the little white note lying between Fairy D's motor on the fourth line and Fairy F's motor on line number five. So without more ado we go to that little note.

Space number four for wee Fairy E,
Tulip and I as good as can be.

Fairy E's tulip

All the fairies are so happy that those in the motor-cars and those who are nestling in the petal of a flower join together in another fairy rhyme:

On lines one, two, three, four, and five
E G B D F arrive;
Then F A C E come between,
In the four spaces we have seen;
Here on the treble staff we've spied them,
With little Treble Clef to guide them.

What a beautiful game of play we can have! No less than fourteen little fairies will play with us.

G B D F A are to be found in their cocoa-nuts on the five lines in the Bass Road. We must run to press down each note and see how quickly we can find them. E G B D F enjoy being in their motor-cars on the five lines in the Treble Road.

Now for the little fairies who love their tulips in the four spaces between the five lines in the Treble Road.

F in the first space.
A in the second space.
C in the third space.
E in the fourth space.

PRIMARY READING LESSON

Little cock sparrow,
Sat up in a tree,
And he chirruped and chirruped
So merry was he.
A naughty boy came
With his wee bow and arrow,
Determined to shoot
This little cock sparrow.

Little cock sparrow up in a tree.
I see you, cock sparrow.
I see you, merry little bird.
Chirrup! Chirrup! Chirrup!

See the little boy,
He has a bow and arrow.
What can he do?
What can cock sparrow do?

This little cock sparrow,
Shall make me a stew,
And his giblets shall make me
A little pie, too.
Oh, no, said the sparrow,
I won't make a stew.
So he flapped his wings,
And away he flew.

Oh, no, little boy,
You shall not have me!
You shall not have a stew!
You shall not have a pie!
Naughty little boy.

Oh, little cock sparrow,
See my bow and arrow.
I shall have you, little bird.
I shall have a stew,
I shall have a pie, too.
Come, little cock sparrow!

ACTION SENTENCES

Play you are a little boy.
Play you have a bow and arrow.
Shoot your bow and arrow.

Play you are a little bird.
Play you are in a tree.
Flap your wings.
Fly away, little bird.

 See page 1408 for illustration.

DRAWING & PAINTING A SPRAY OF LEAVES

THIS time we are going to draw and paint a spray of leaves. First, we must find a spray. Any kind of leaves will do, but it is better to begin with the sort that are called evergreens—laurel, ivy, box, or even yew. This is because all leaves and flowers change very quickly, especially after they are picked; and, unless you are clever, they will alter almost before you have time to begin, and this is very confusing when you are trying to copy them carefully.

You remember when we drew the twigs how the stalk was thicker where each little bud grew? Now you will notice that wherever the leaf springs from the stem there is a little swelling; sometimes it is much bigger than at other times.

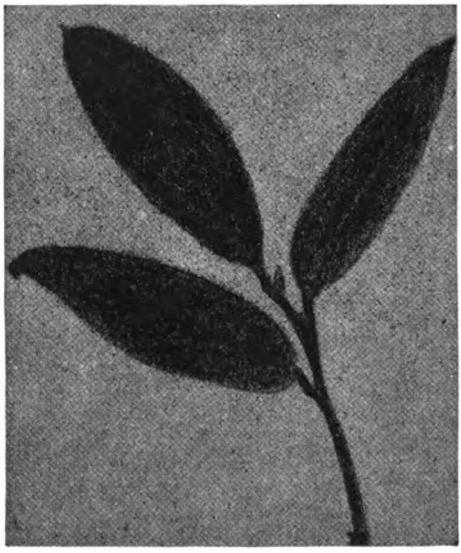
The stalk of the leaf is not the same thickness all the way down, either. Some kinds of laurel leaves are rounded at the tips and where they join the stalks, and some are pointed. Whichever kind of leaf we have chosen, we must look at all these things and notice the different shapes, because to-day we want to try to draw from memory a single leaf with its stalk before we copy the spray.

When we think we can remember it quite well, we should hide it away somewhere, and then get out our drawing things. Let us number them.

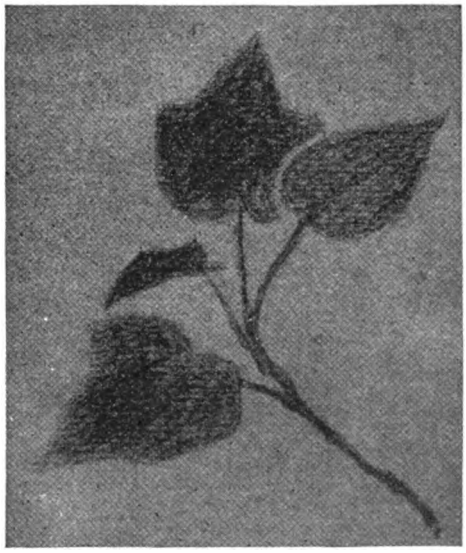
1. The drawing board and pins.
2. The black and the white chalk and brown and white paper.
3. The jar of clean water, the sponge, the paint-box and brushes, and two B pencils—one with a chisel and one with a sharp point.

Now draw the leaf from memory, with its stalk, on brown paper in black chalk, or, if you like, on white paper. Draw several if the first is not a good one; then get your leaves, and see if you have remembered well what one of them was like. See if you have drawn it large enough or too large; if the tip is the right shape; if it joins the stalk properly. Then copy carefully a leaf by itself. You cannot put in the veins nicely with the black chalk, so do not try. It is better to do this with the pencil afterwards, or even to leave them out altogether till you have had more practice. They are so fine and delicate that they must not be made to look as if they were coarse and hard. The veins are just little hollow pipes which carry the sap to feed the leaf, so they want very careful drawing.

Now we will try the spray. Put it on the paper first, and see about how much space it takes up. Put a dot where the tip of each leaf comes on the paper, and where the small stalks and the big stalks



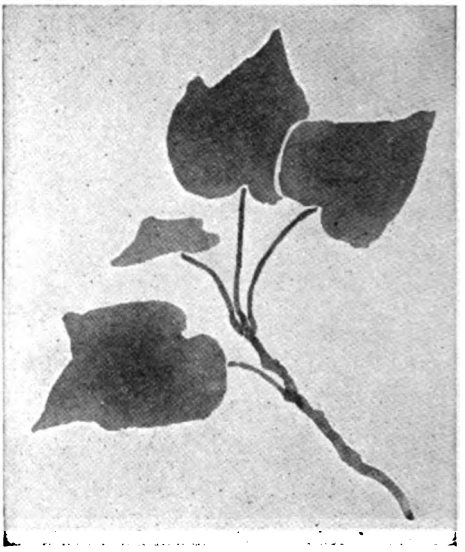
This is how the laurel spray should look when it is drawn from memory in black chalk on brown paper.



If we have chosen ivy leaves to draw instead of laurel leaves, this picture will do to compare our drawing with.

begin and end. If you have not drawn stalks and leaves before, this way will help you, but do not always use the dots; you will not learn to draw so quickly if you do. Put the spray on the left-hand side, and begin with the big stem. Notice if it curves or bends, then draw the leaf-stalks and then the leaves themselves. We shall find it better not to draw the leaves with a single line round them at first, but to rub the chalk sideways on the paper, getting the direction the leaf takes carefully, and drawing it big. The pictures on the last page show laurel and ivy, but any leaves must be drawn in the same way, beginning first with the long stems. We can practise drawing the spray with a brushful of colour in green paint to match the shade of the leaves, or in brown or black paint like the picture above. Moisten the paper with the damp sponge first. If the paper glistens when you hold it level with the eye, it is too wet.

Now we have to make a copy of our laurel leaves, painting them straight away on white paper.



Here is a picture of a spray of ivy leaves painted on white paper. Remember to start with the stalk.

A good, bright green is made by mixing Prussian blue, gamboge, and burnt sienna. A good dark green is made by mixing together indigo and burnt sienna, or Prussian blue and Vandyke brown. We shall find that there are a great many ways of mixing greens when we know our paints.

If we are not tired of our spray by this time, we can try to draw it in pencil on white paper. We must draw the long stem first, just in the same way as we began with the black chalk, but now the leaves must be drawn in *outline*. This is much more difficult. Use the chisel-pointed pencil first, draw lightly on the paper, and do not put your fingers close to the point, but well down the pencil. Use the sharp point to draw all the fine parts—the veins and the thin stalks. Do not try to draw all the little veins, but only the big ones. Remember to make the stalks and the big veins double.

This is a spray of leaves drawn in "outline" in lead pencil on white paper. Use the chisel-pointed pencil, and make the stalks and the biggest of the veins with double lines.

LITTLE PICTURE-STORIES IN FRENCH

IN our story this time, which is continued from page 1215, we read how the party travel from Calais to their hotel in Paris. The first line under each picture is the French, the second gives the English word for the French word above it, and the third line shows how we make up the words into our own language.

Nous sommes à Calais.
We are at Calais.
We are at Calais.

Le bateau s'arrête.
The boat itself stops.
The boat stops.

Nous courons au côté.
We run to the side.
We run to the side.

Les marins baissent la passerelle.
The sailors lower the gangway.
The sailors let down the gangway.

Nous voulons quitter le bateau.
We wish to quit the boat.
We want to get off the boat.

Bébé dit: "Regardez ces bonshommes!"
Baby says: "Look at those manikins!"
Baby says: "Look at those funny men!"

Ils ressemblent à des poupées.
They resemble to some dolls.
They look like dolls.

Ce sont les gendarmes.
They are the men-at-arms.
They are "gendarmes."

Nous allons à la douane.
We go to the customs house.
We go to the custom house.

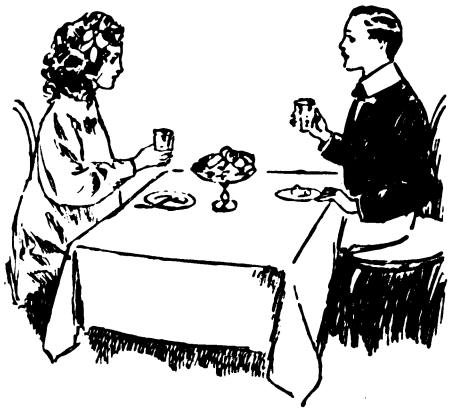
Tout le monde cherche ses bagages.
Everybody seeks their baggage.
Everybody looks for their luggage.

Le train nous attend.
The train us awaits.
The train is waiting for us

Il y a le temps de déjeuner.
There is the time of to lunch.
There is time for lunch.

Papa nous dit de rester près de lui.
Papa us tells of to stay near of to him.
Papa tells us to keep by him.

Nous avons du lait et des gâteaux.
We have some milk and some cakes.
We have milk and cakes.



Papa regarde sa montre.
Papa looks at his watch.
Papa looks at his watch.

Il faut se depêcher.
It is necessary to hurry oneself.
We must hurry.

Nous montons pour chercher des places.
We mount for to seek some places.
We get in to look for seats.

Le train est complet.
The train is complete.
The train is full.

Enfin nous nous asseyons.
At last we ourselves seat.
At last we are seated.

Maman est trés fatiguée.
Mamma is very tired.
Mamma is very tired.

Un garçon prête un livre à moi.
A boy lends a book to me.
A boy lends me a book.

Je dis: "Merci bien."
I say: "Thank you well."
I say: "Thank you very much."

Je regarde le livre.
I look at the book.
I look at the book.

Je le montre à Jeannette.
I it show to Jenny.
I show it to Jenny.

Nous sommes dans le train quatre heures.
We are in the train four hours.
We are in the train four hours.

Enfin nous voila arrivés à Paris.
At last we there are arrived at Paris.
At last we are in Paris

Nous allons en voiture à l'hôtel.
We go in cab to the hotel.
We drive to our hotel.

The next School Lessons begin on page 1685